

00560C-104.DWG, UPDATED ON 12/08/03 AT 08:50, X

CONSTRUCTION NOTES

GENERAL CONSTRUCTION NOTES:

- 1. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH 2002 VIRGINIA DEPARTMENT OF TRANSPORTATION'S ROAD AND BRIDGE SPECIFICATION (VDOT RBS), EXCEPT AS OTHERWISE NOTED, ALSO PROVISIONS THEREIN FOR METHOD OF MEASUREMENT AND PAYMENT DO NOT APPLY. REFERENCES TO "ENGINEER" AND "STATE" SHALL BE INTERPRETED TO MEAN "CONTRACTING OFFICER" AND THE "FEDERAL GOVERNMENT" RESPECTIVELY.
- 2. VDOT RBS IS AVAILABLE ON LINE AT http://virginiadot.org/business/default.asphttp://virginiadot.org/business/default.asphttp://virginiadot.org/business/default.asphttp://virginiadot.org/business/default.asphttp://virginiadot.org/business/default.asphttp://virginiadot.org/business/default.asphttp://virginiadot.org/business/default.asphttp://virginiadot.org/business/default.asphttp://virginiadot.org/business/default.asphttp://vir
- 3. REFERENCES INDICATED HEREIN SHALL BE THE MOST CURRENT VERSION AVAILABLE AT THE TIME OF SIGNATURE OF THESE DRAWINGS, UNLESS NOTED OTHERWISE.

EROSION AND SEDIMENT CONTROL:

- 1. PROVIDE EROSION AND SEDIMENT CONTROL MEASURES IN ACCORDANCE WITH VIRGINIA SOIL AND WATER CONSERVATION COMMISSION'S (VSWCC) 1992 VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH). THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK IS AVAILABLE ONLINE AT HTTP://www.dcr.state.va.us/sw/e&s-ftp.htm.
- 2. <u>TEMPORARY SEEDING</u>— PROVIDE TEMPORARY SEED, LIME, AND FERTILIZER IN ACCORDANCE WITH VSWCC VESCH, STANDARD 3.31. WITHIN 48 HOURS AFTER ATTAINING THE GRADING INCREMENT SPECIFIED HEREIN, PROVIDE SEED, FERTILIZER, MULCH AND WATER ON GRADED AREAS WHEN ANY OF THE FOLLOWING CONDITIONS OCCUR:
- A. GRADING OPERATIONS STOP FOR AN ANTICIPATED DURATION OF 30 DAYS OR MORE.
- B. WHEN IT IS IMPOSSIBLE OR IMPRACTICAL TO BRING AN AREA TO FINISH GRADE SO THAT PERMANENT SEEDING OPERATIONS CAN BE PERFORMED WITHOUT SERIOUS DISTURBANCE FROM ADDITIONAL GRADING.
- C. GRADING OPERATIONS FOR A SPECIFIC AREA ARE COMPLETED AND THE SEEDING SEASONS SPECIFIED FOR PERMANENT SEEDING IS MORE THAN 30 DAYS AWAY.
- D. WHEN AN IMMEDIATE COVER IS REQUIRED TO MINIMIZE EROSION, OR WHEN EROSION HAS OCCURRED.
- E. PROVIDE ON EROSION CONTROL DEVICES CONSTRUCTED USING SOIL MATERIALS.
- 3. <u>STATE STANDARD FILTER BARRIER</u>—PROVIDE VSWCC VESCH STANDARD 3.05, SILT FENCE WHERE INDICATED.
- 4. <u>TEMPORARY CONSTRUCTION ENTRANCE</u>—PROVIDE TEMPORARY CONSTRUCTION ENTRANCE WHERE INDICATED IN ACCORDANCE WITH VSWCC VESCH STANDARD 3.02. PROVIDE FILTER FABRIC AND AGGREGATE. PLACE FABRIC IN ONE PIECE, WHERE POSSIBLE. OVERLAP FABRIC JOINTS A MINIMUM OF 12 INCHES.

EARTHWORK:

- 1. EXISTING SUBGRADE SHOULD BE USED TO THE EXTENT POSSIBLE.
- 2. ADDITIONAL MATERIAL REQUIRED UNDER PAVEMENTS OR SIDEWALKS SHALL BE IN ACCORDANCE WITH ASTM D 2487, CLASSIFICATION GW, GP, GM, SW, SP, SM WITH A MAXIMUM ASTM D 4318 LIQUID LIMIT OF 35, MAXIMUM ASTM D 4318 PLASTICITY INDEX OF 12, AND A MAXIMUM OF 25 PERCENT BY WEIGHT PASSING ASTM D 1140, NO. 200 SIEVE.
- 3. ADDITIONAL MATERIAL REQUIRED FOR OPEN AREAS, SUCH AS GRASS AREAS, SHALL BE NATURAL, FRIABLE SOIL REPRESENTATIVE OF PRODUCTIVE, WELL-DRAINED SOILS IN THE AREA, FREE OF SUBSOIL, STUMPS, ROCKS LARGER THAN 1 INCH DIAMETER, BRUSH, WEEDS, TOXIC SUBSTANCES, AND OTHER MATERIAL DETRIMENTAL TO PLANT GROWTH. AMEND TOPSOIL PH RANGE TO OBTAIN A PH OF 5.5 TO 7.
- 4. <u>COMPACTION</u>—FOR AREAS UNDER PAVEMENTS AND SIDEWALKS COMPACT TOP 12 INCHES OF SUBGRADES TO 95 PERCENT OF ASTM D 698. PLACE FILL MATERIAL IN 6 INCH MAXIMUM LIFTS AND COMPACT TO 95 PERCENT OF ASTM D 698
- 5. <u>PERMANENT SEEDING</u>— PROVIDE STATE CERTIFIED SEED MIXTURE AS SPECIFIED IN VSWCC VESCH STANDARD 3.32. PLANT FESCUE DURING FALL MONTHS, PLANT BERMUDA DURING SUMMER MONTHS.

CAST-IN-PLACE CONCRETE AND MISCELLANEOUS CONCRETE PAVEMENT:

- 1. CAST-IN-PLACE CONCRETE SHALL BE IN ACCORDANCE WITH THE AMERICAN CONCRETE INSTITUTE (ACI) "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" ACI 318-02.
- 2. ALL CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI AND BE AIR ENTRAINED.
- 3. REINFORCING BARS, ACI 301/301M UNLESS OTHERWISE SPECIFIED. ASTM A 615/A 615M WITH THE BARS MARKED A, S, W, GRADE 60; OR ASTM A 996M WITH THE BARS MARKED TYPE R. GRADE 60.
- 4. WELDED WIRE SHALL CONFORM TO ASTM A 185 OR ASTM A 497. PROVIDE FLAT SHEETS OF WELDED WIRE FABRIC FOR SLABS.
- 5. REINFORCING MARKED CONTINUOUS (CONT.) SHALL BE LAPPED 40 BAR DIAMETERS AT SPLICES.
- 6. LAP WELDED WIRE FABRIC 12 INCHES MINIMUM.
- 7. JOINTS:
- A. EXPANSION/CONTRACTION JOINT FILLER: ASTM D1751, ASTM D1752, OR 100% RECYCLED MATERIAL MEETING ASTM D1752 (SUBPARAGRAPHS 5.1 TO 5.4). MATERIAL SHALL BE 1/2 INCH THICK, UNLESS OTHERWISE INDICATED. FILL EXPANSION JOINTS NOT EXPOSED TO WEATHER WITH PREFORMED JOINT FILLER MATERIAL. COMPLETELY FILL JOINTS EXPOSED TO WEATHER WITH JOINT FILLER MATERIAL AND JOINT SEALANT. DO NOT EXTEND REINFORCEMENT OR OTHER EMBEDDED METAL ITEMS BONDED TO THE CONCRETE THROUGH ANY EXPANSION JOINT UNLESS AN EXPANSION SLEEVE IS USED. PROVIDE CONTRACTION JOINTS, EITHER FORMED OR SAW CUT OR CUT WITH A JOINTING TOOL, TO THE INDICATED DEPTH AFTER THE SURFACE HAS BEEN FINISHED. SAWED JOINTS SHALL BE COMPLETED WITHIN 4 TO 12 HOURS AFTER CONCRETE PLACEMENT. PROTECT JOINTS FROM INTRUSION OF FOREIGN MATTER.
- B. <u>CONSTRUCTION JOINTS</u>: LOCATE JOINTS TO LEAST IMPAIR STRENGTH. CONTINUE REINFORCEMENT ACROSS JOINTS UNLESS OTHERWISE INDICATED.
- 8. JOINT SEALANTS:
- A. HORIZONTAL SURFACES, 3 PERCENT SLOPE, MAXIMUM: ASTM D1190 OR ASTM C920, TYPE M, CLASS 25, USE T.
- B. VERTICAL SURFACES GREATER THAN 3 PERCENT SLOPE: ASTM C920, TYPE M, GRADE NS, CLASS 25, USE T.

- 9. <u>CONCRETE SIDEWALKS</u>— PROVIDE CONTRACTION JOINTS SPACED EVERY 5 LINEAR FEET UNLESS OTHERWISE INDICATED. CUT CONTRACTION JOINTS ONE INCH DEEP WITH A JOINTING TOOL AFTER THE SURFACE HAS BEEN FINISHED. PROVIDE 0.5 INCH THICK TRANSVERSE EXPANSION JOINTS AT CHANGES IN DIRECTION WHERE SIDEWALK ABUTS CURB, STEPS, RIGID PAVEMENT, OR OTHER SIMILAR STRUCTURES; SPACE EXPANSION JOINTS EVERY 50 FEET MAXIMUM. GIVE WALKS A BROOMED FINISH. UNLESS INDICATED OTHERWISE, PROVIDE A TRANSVERSE SLOPE OF 1/48. LIMIT VARIATION IN CROSS SECTION TO 1/4 INCH IN 5 FEET.
- 10. <u>PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION</u>— PROVIDE PAVEMENT AND MISCELLANEOUS CONSTRUCTION FINISH IN ACCORDANCE WITH ACI 302.1R, UNLESS OTHERWISE SPECIFIED. PROVIDE BROOMED FINISH FOR CONCRETE SIDEWALKS. FOR ALL OTHER CONCRETE, PROVIDE PAVEMENT FINISH.
- A. FINISH-PLACE, CONSOLIDATE, AND IMMEDIATELY STRIKE OFF CONCRETE TO OBTAIN PROPER CONTOUR, GRADE, AND ELEVATION BEFORE BLEEDWATER APPEARS. PERMIT CONCRETE TO ATTAIN A SET SUFFICIENT FOR FLOATING AND SUPPORTING THE WEIGHT OF THE FINISHER AND EQUIPMENT. IF BLEEDWATER IS PRESENT PRIOR TO FLOATING THE SURFACE, DRAG THE EXCESS WATER OFF OR REMOVE BY ABSORPTION WITH POROUS MATERIALS. DO NOT USE DRY CEMENT TO ABSORB BLEEDWATER.
- B. FLOATED-USE FOR EXTERIOR SLABS WHERE NOT OTHERWISE SPECIFIED. AFTER THE CONCRETE HAS BEEN PLACED, CONSOLIDATED, STRUCK OFF, AND LEVELED, DO NOT WORK THE CONCRETE FURTHER, UNTIL READY FOR FLOATING. WHETHER FLOATING WITH A WOOD, MAGNESIUM, OR COMPOSITE HAND FLOAT, WITH A BLADED POWER TROWEL EQUIPPED WITH FLOAT SHOES, OR WITH A POWERED DISC, FLOAT SHALL BEGIN WHEN THE SURFACE HAS STIFFENED SUFFICIENTLY TO PERMIT THE OPERATION. DURING OR AFTER THE FIRST FLOATING, SURFACE SHALL BE CHECKED WITH A 10 FOOT STRAIGHTEDGE APPLIED AT NO LESS THAN TWO DIFFERENT ANGLES, ONE OF WHICH IS PERPENDICULAR TO THE DIRECTION OF STRIKE OFF. HIGH SPOTS SHALL BE CUT DOWN AND LOW SPOTS FILLED DURING THIS PROCEDURE TO PRODUCE A SURFACE LEVEL WITHIN 1/4 INCH IN 10 FEET.
- C. BROOMED-USE ON SURFACES OF EXTERIOR WALKS, PLATFORMS, PATIOS, AND RAMPS, UNLESS OTHERWISE INDICATED. PERFORM A FLOATED FINISH, THEN DRAW A BROOM OR BURLAP BELT ACROSS THE SURFACE TO PRODUCE A COARSE SCORED TEXTURE. PERMIT SURFACE TO HARDEN SUFFICIENTLY TO RETAIN THE SCORING OR RIDGES. BROOM TRANSVERSE TO TRAFFIC OR AT RIGHT ANGLES TO THE SLOPE OF THE SLAB.

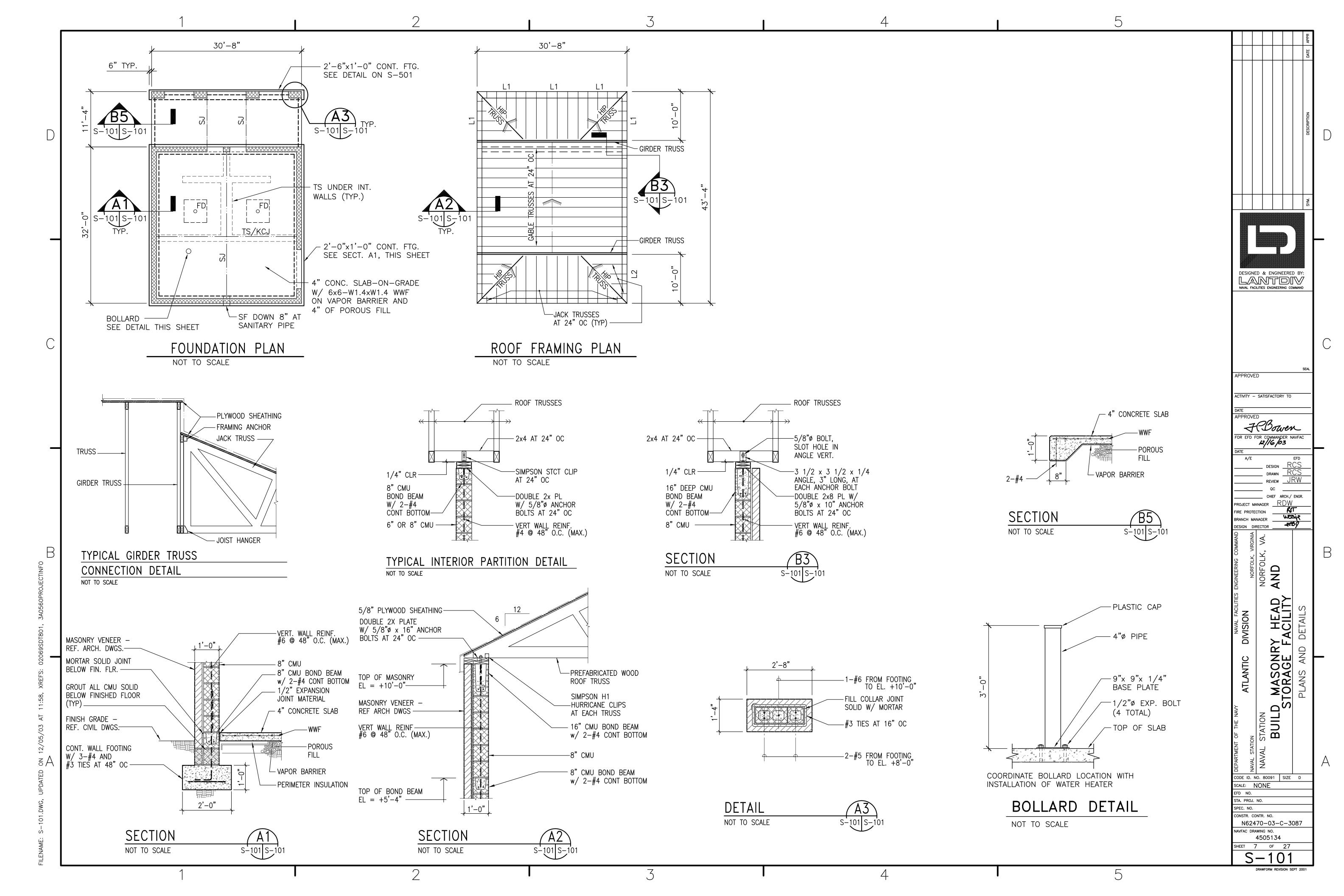
STEEL:

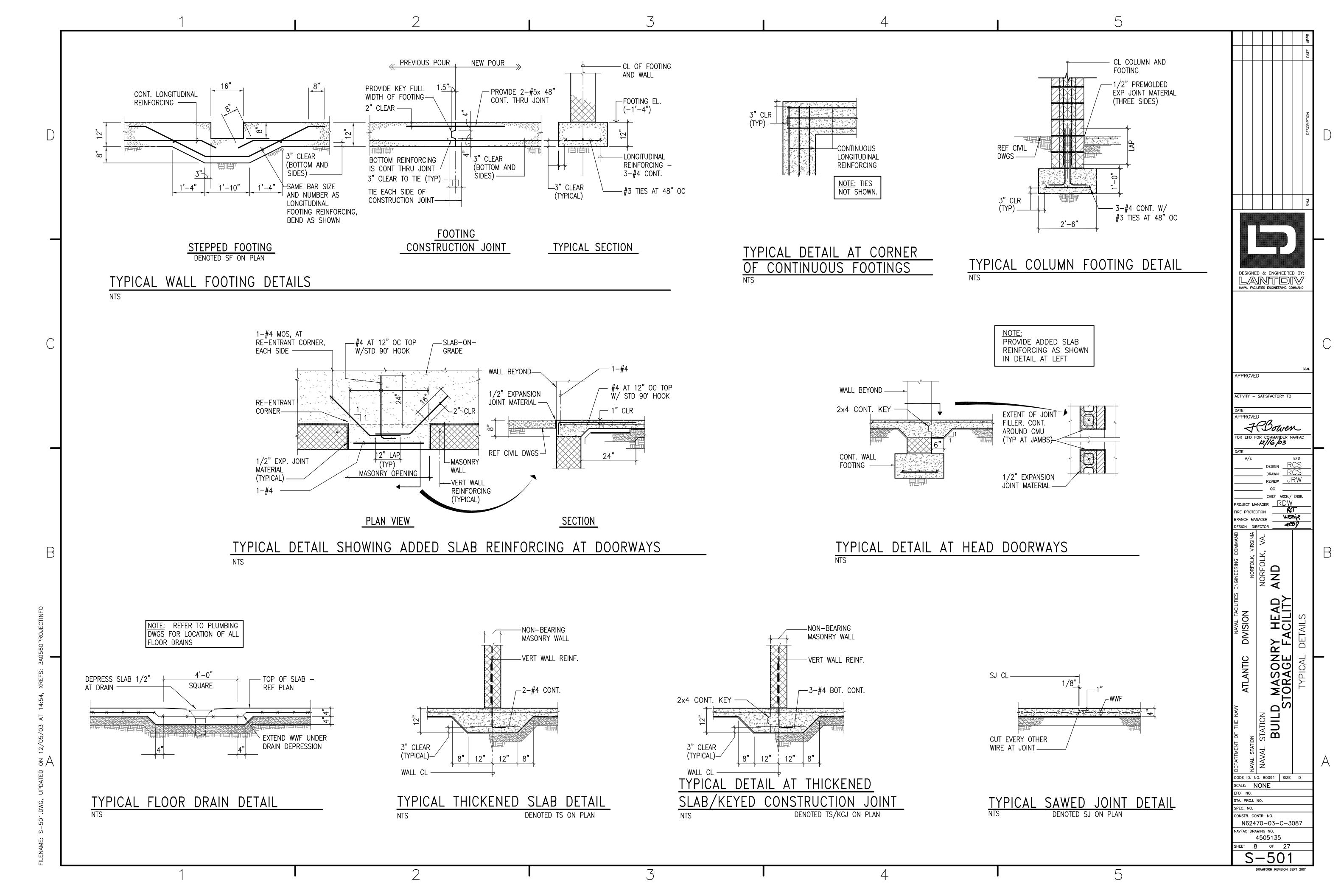
- 1. ALL STEEL SHALL BE ASTM A 36.
- 2. HOT-DIP GALVANIZE ITEMS AFTER FABRICATION. GALVANIZING: ASTM A 123/A 123M, ASTM A 153/A 153M OR ASTM A 653/A 653M, G90, AS APPLICABLE.

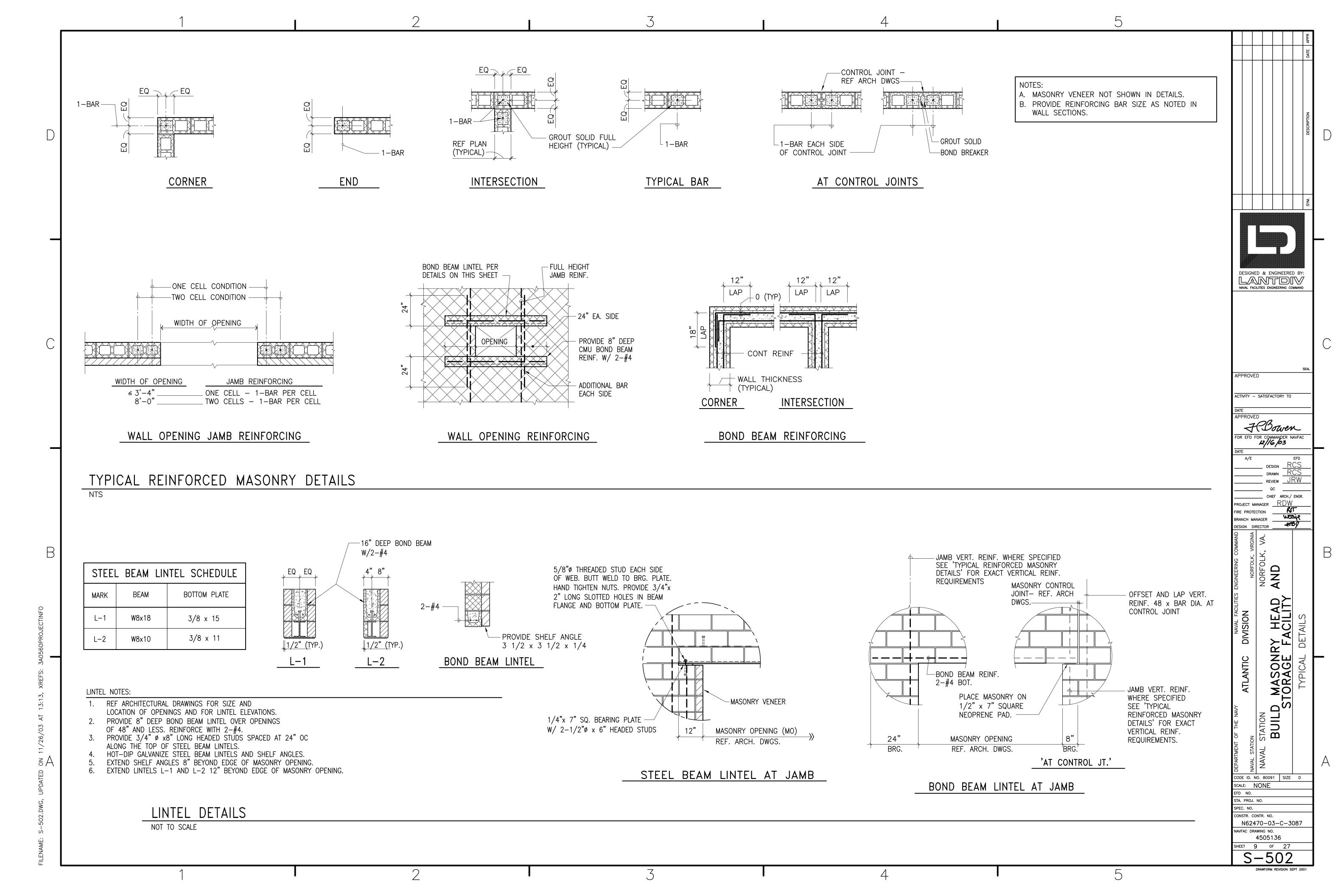
DESIGNED & ENGINEERED BY: LANTDIV APPROVED CTIVITY - SATISFACTORY TO 7 Bowen OR EFD FOR COMMANDER NAVFAC review <u>JSC</u> CHIEF ARCH./ ENGR. ROJECT MANAGER <u>RDW</u> FIRE PROTECTION BRANCH MANAGER ESIGN DIRECTOR Z IJ Z **ZW** 0 00 SA MAS TOR, CODE ID. NO. 80091 SIZE D SCALE: NONE EFD NO. STA. PROJ. NO. SPEC. NO. CONSTR. CONTR. NO. N62470-03-C-3087 NAVFAC DRAWING NO.

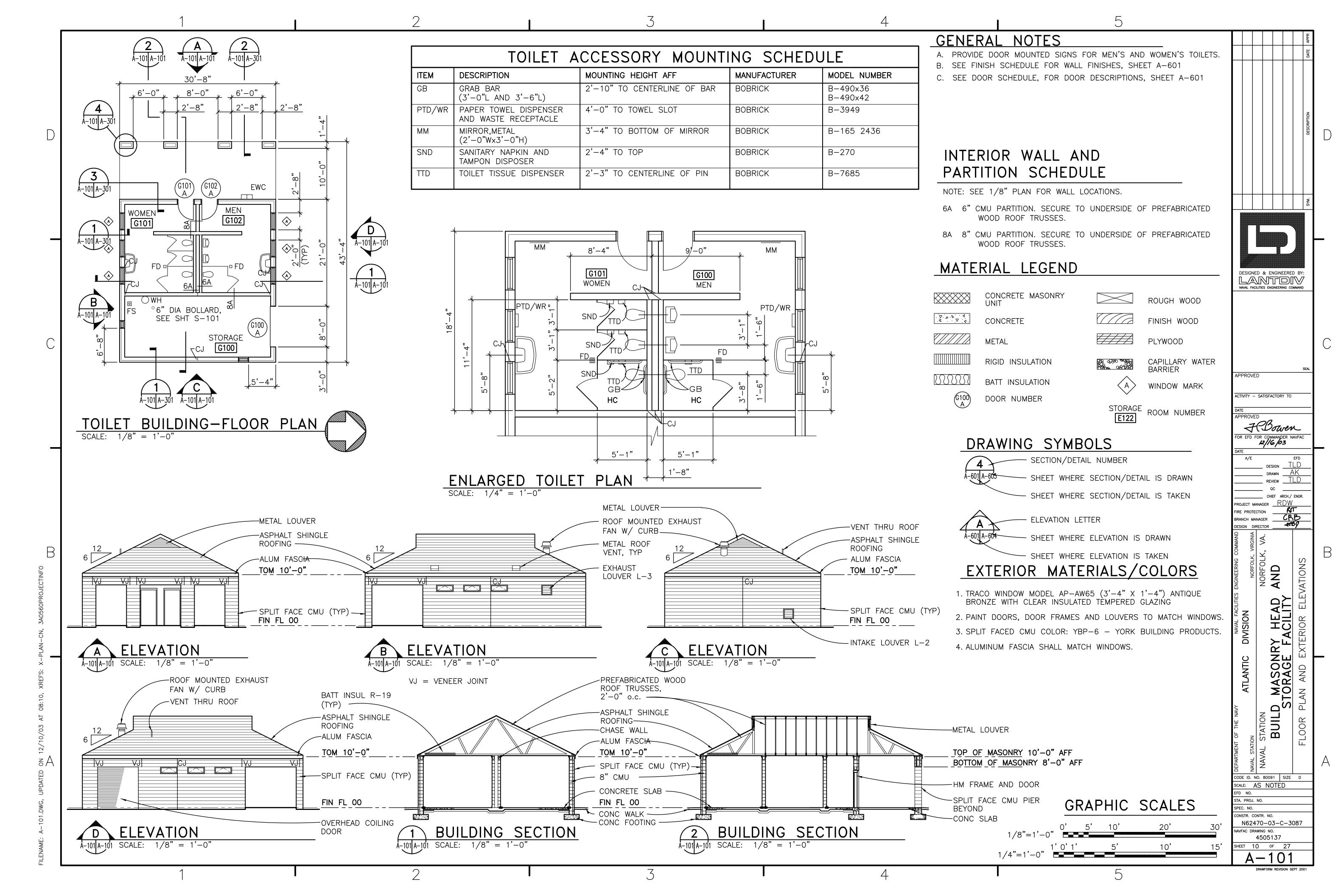
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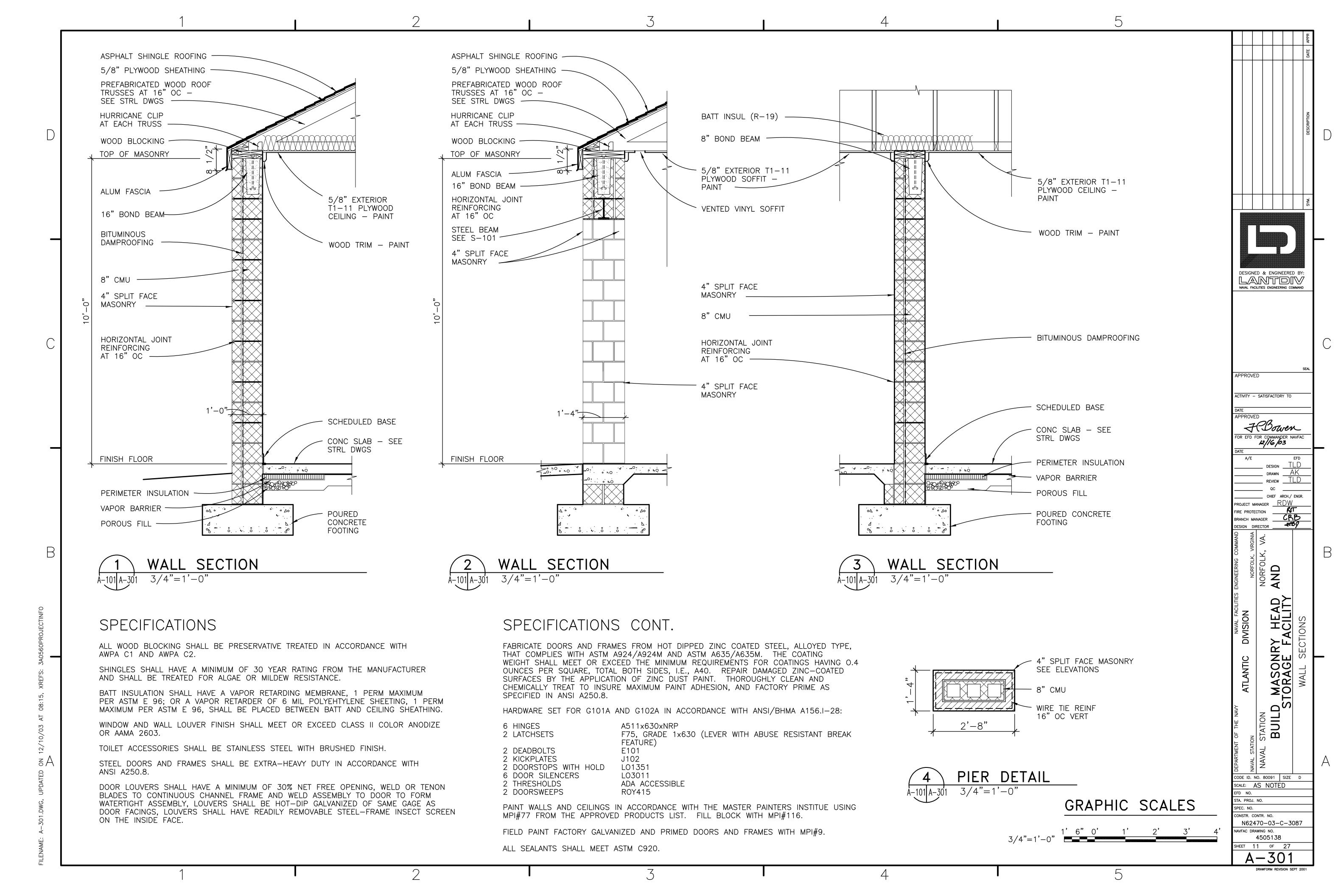
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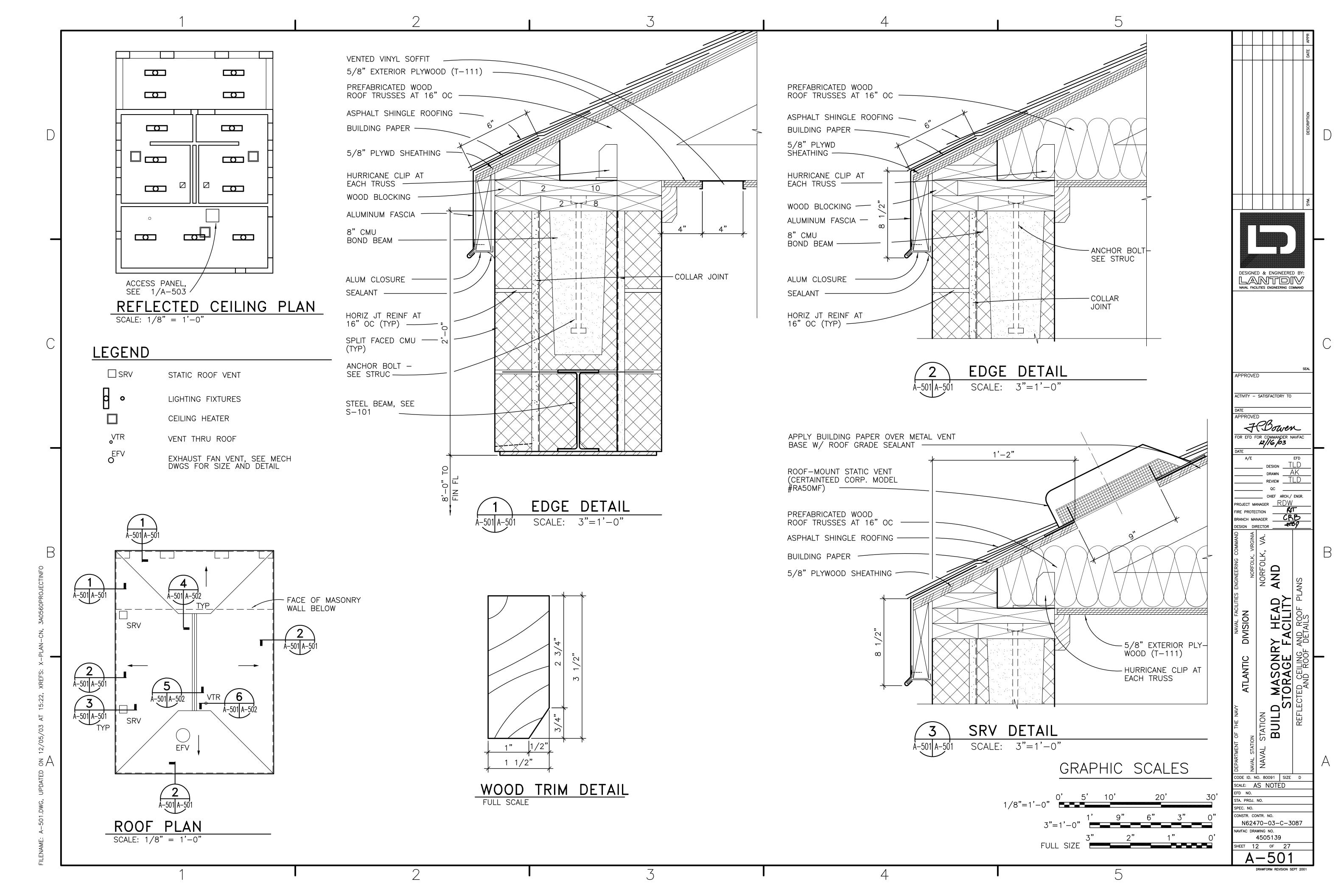


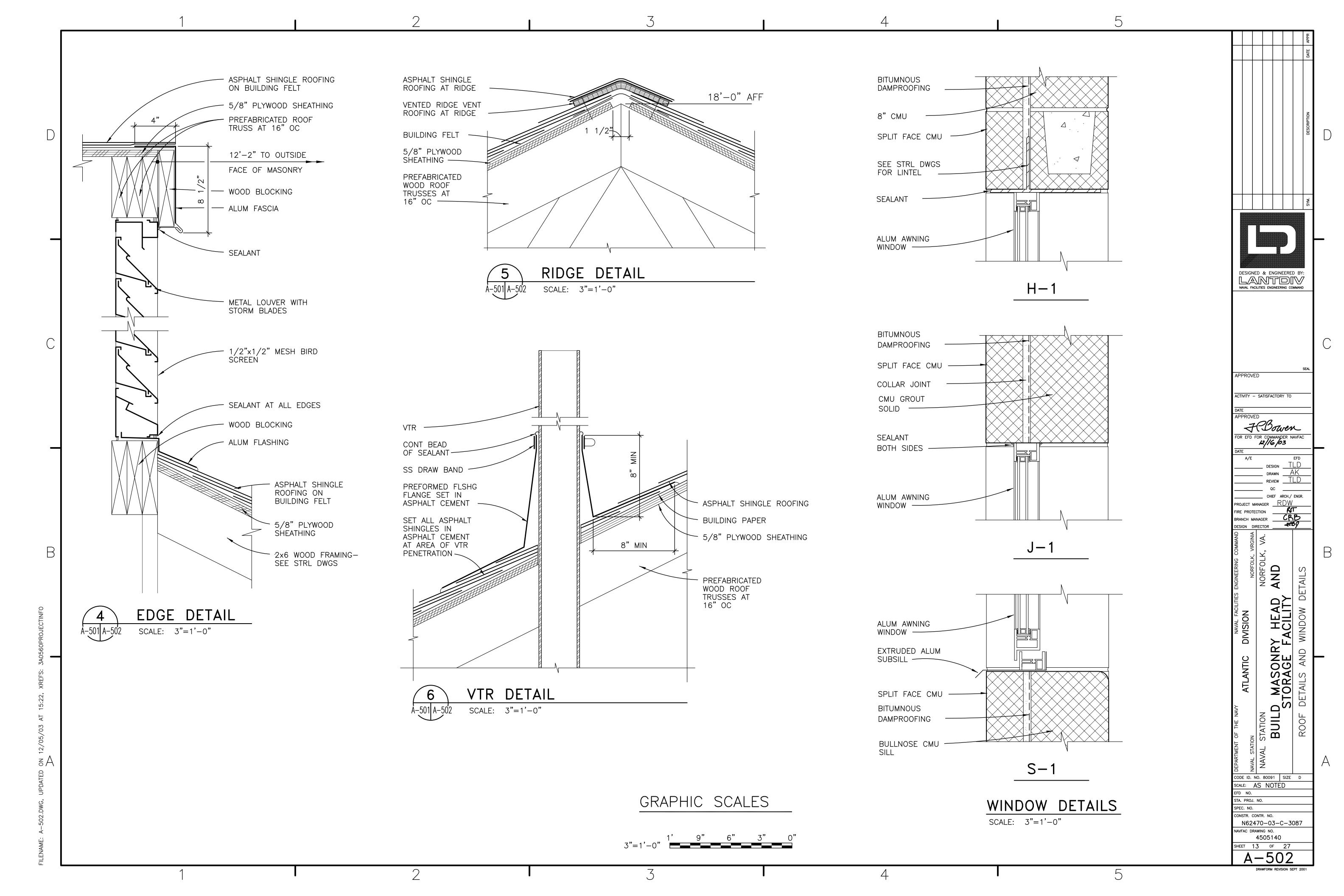


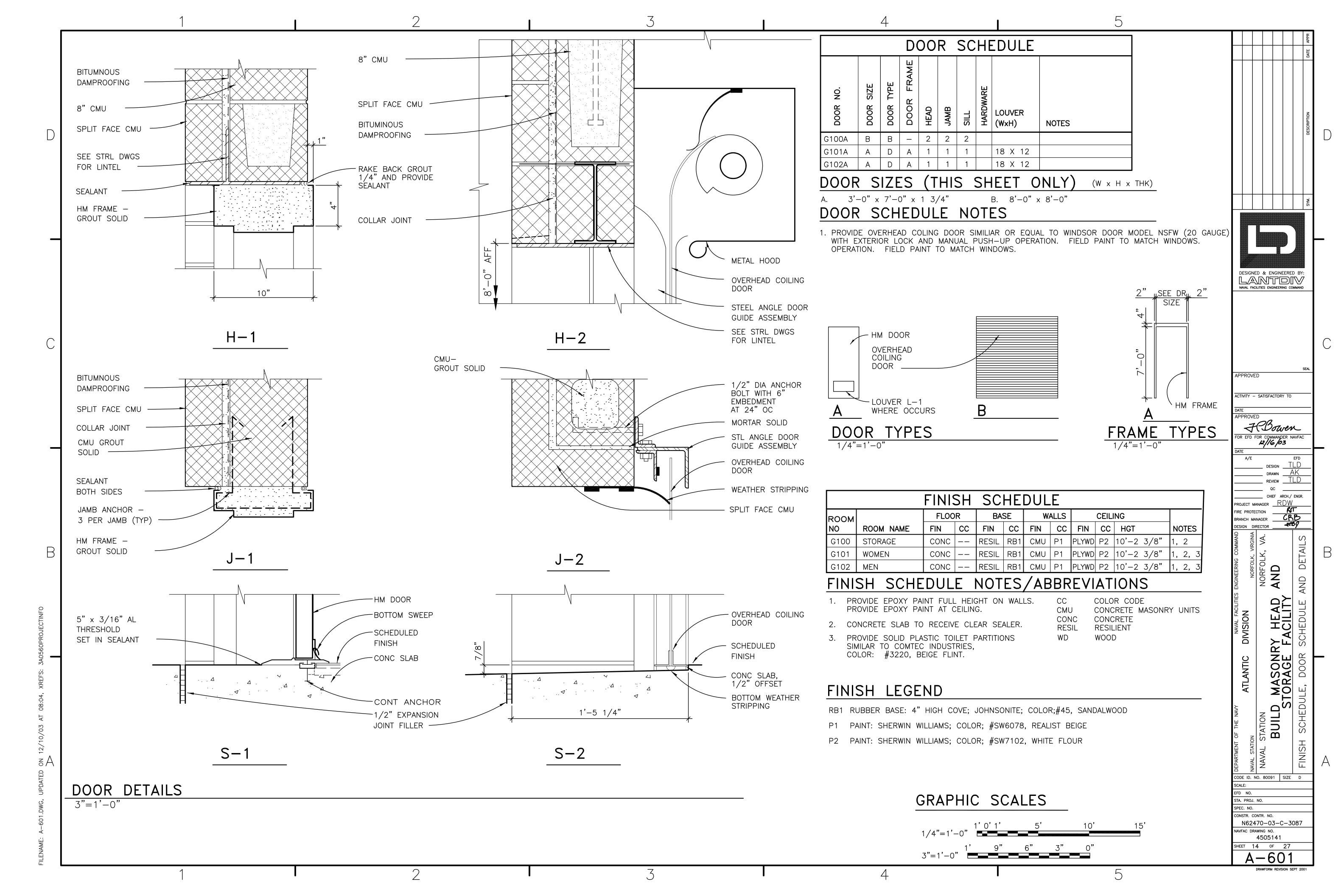




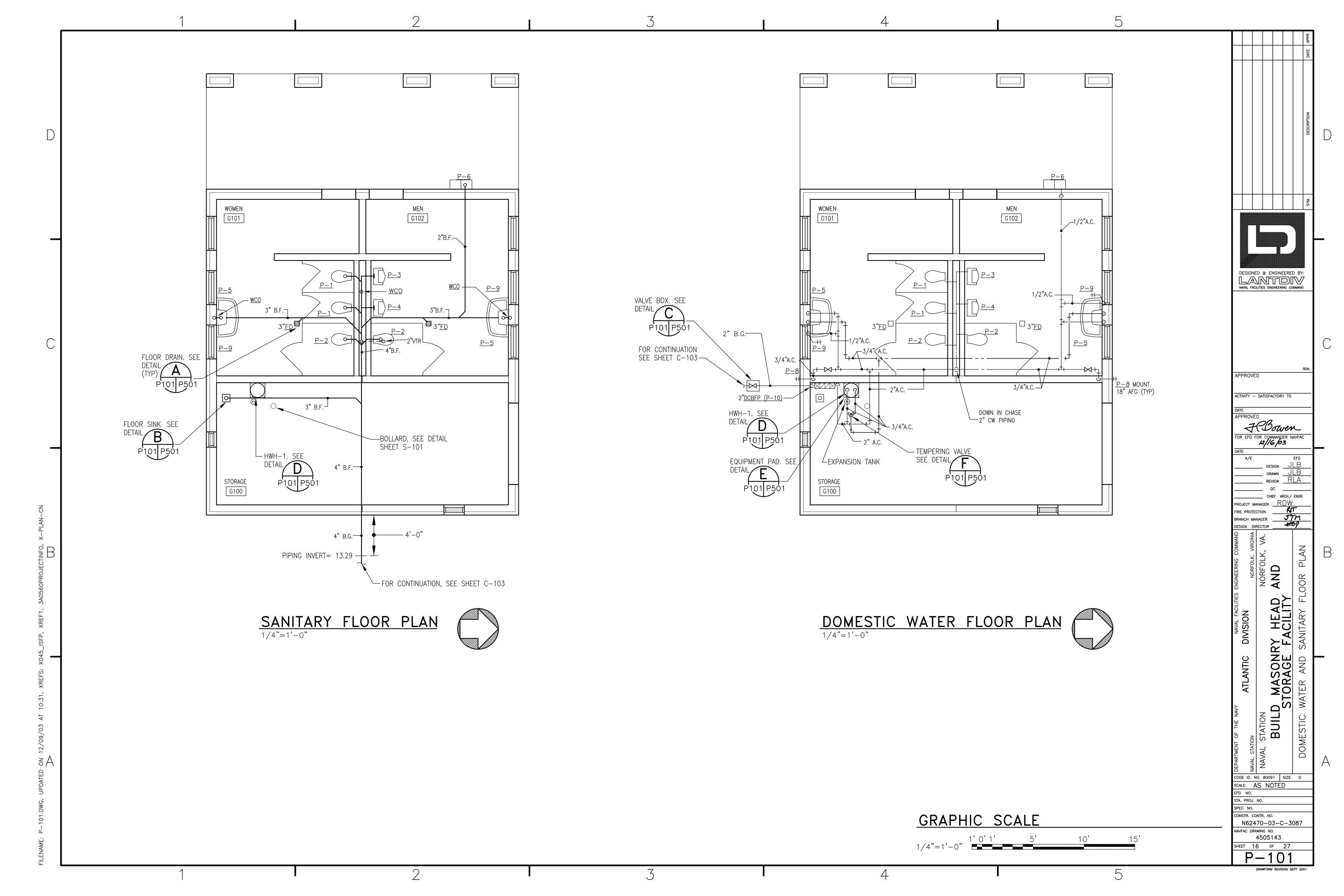


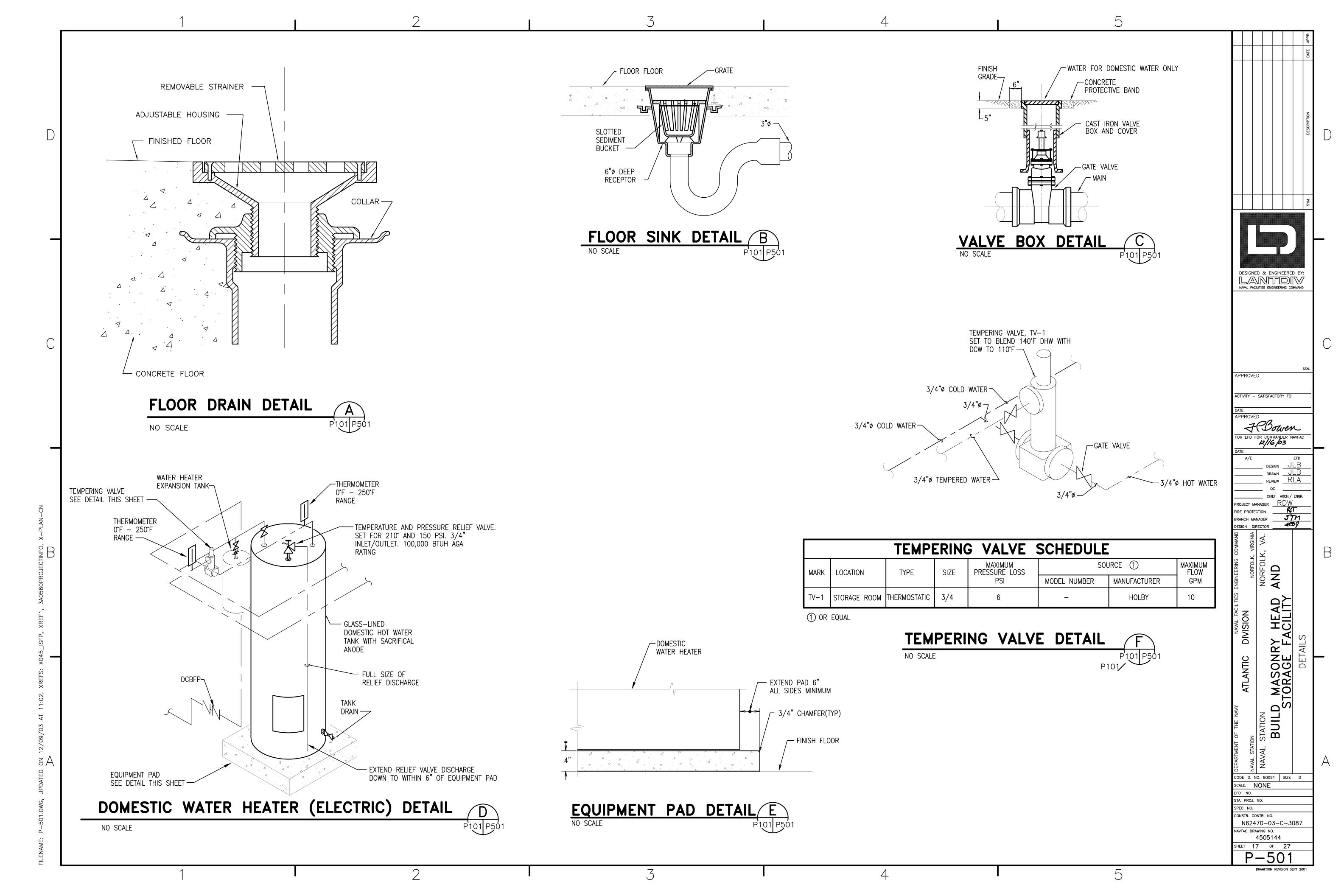


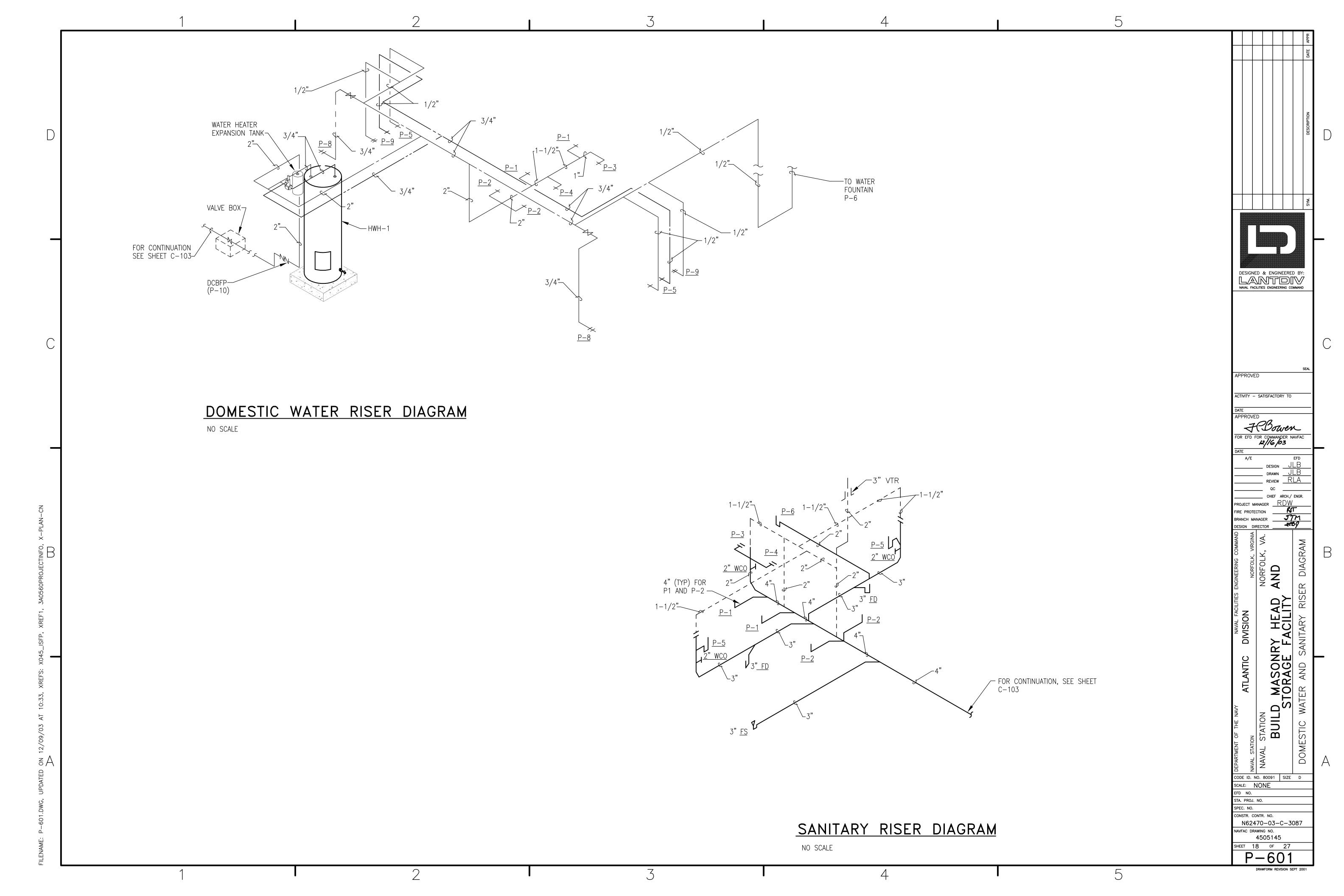




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GENERAL NOTES

- 1 PROVIDE UL LISTED THROWAWAY FIBERGLASS FILTERS, STANDARD DUST-HOLDING CAPACITY IN THE CABINET HEATERS.
- 2 PROVIDE HINGED BOTTOM PANEL WITH LATCHES FOR ACCESS TO FILTER AND FAN MOTOR FOR THE CABINET HEATERS.
- 3 AMCA 210 WITH AMCA SEAL. PROVIDE DIRECT CONNECTED MOTOR PROVIDE WITH FAN GUARD AND BACKDRAFT DAMPER. PROPELLER SHALL BE STATICALLY AND DYNAMICALLY BALANCE ON PROPELLER WALL FAN.
- 4 PROVIDE A LOW-SILHOUETTE, CURB MOUNTED, DOME TYPE ROOF RELIEF VENT EQUIPPED WITH WATERPROOF TOP. PROVIDE CURB TIEDOWN AND BIRDSCREEN.
- 5 DUCT CONSTRUCTION, METAL GAGE, AND HANGERS AND SUPPORT REINFORCEMENT SHALL CONFORM WITH SMACNA HVACMF.
- 6 LOUVER SHALL BEAR AMCA CERTIFIED RATING PROGRAM SEAL FOR AIR PERFORMANCE AND WATER PENETRATION IN ACCORDANCE WITH AMCA 500 AND AMCA 511.

HVAC DUCTWORK LEGEND

CEILING EXHAUST

	REFERENCES								
STANDARD	DESCRIPTION								
AMCA 210 (1990) TESTING FANS FOR RATING									
AMCA 500 (1991) LOUVERS, DAMPERS AND SHUTTERS									
AMCA 511 (1991) CERTIFIED RATING PROGRAM FOR AIR CONTROL DEVICES									
ASTM A 653/A653M	(2000) STEEL SHEET, ZINC-COATED (GALVANIZED)								
UL 507	(1999;BUL. 1999 AND 2000) ELECTRIC FAN								
NFPA 90A	(1999) INSTALLATION OF AIR CONDITIONING AND VENTILATING SYSTEMS								
SMACNA HVACMF	(1995; ADDENDUM 1997) HVAC DUCT CONSTRUCTION STANDARDS — METAL AND FLEXIBLE								
SMACNA HVACTM	(1985) HVAC AIR DUCT LEAKAGE TEST MANUAL								

DE	DESIGN CONDITIONS											
DOOM		INDOC	OR 1		OUTDOC	R						
ROOM DESCRIPTION	SUMMER		WINTER	SUMMER		WINTER						
	*FDB	%RH	*FDB	*FDB	*FWB	*FDB						
TOILET ROOM	-	-	68	91	76	23						
STORAGE ROOM	_	_	50	91	76	23						

1) SUMMER EXHAUST VENTILATION

	RELIEF VENT SCHEDULE												
MARK	CFM	THROAT DIMEN.	MAX. S.P. IN. W.G.	DAMPER TYPE	R (BY V SIZE	ENT MFGR.) △P (IN.WG.)	SOU MODEL NUMBER	RCE (1) MANUFACTURER	LOCATION	REMARKS			
RV-1	450	16"x16"	0.05	NONE	_	-	GSAA12	CARNES	ROOFTOP	1 2			

- 1 OR EQUAL
- 2 WITH BIRD SCREEN
- 3 PROVIDE MFGR'S PRE-FAB ROOF CURB

	LOUVER SCHEDULE												
MARK	CFM	SIZE (W x H x D)	MAX.PD.(WG)	MOUNTING HEIGHT 2	SOU MODEL NUMBER	JRCE (1) MANUFACTURER	LOCATION	REMARKS					
L-1	225	18"x12"x1-1/2"	.05	_	ESJ-150	GREENHECK	TOILET ROOM	3					
L-2	540	24"x24"x4"	.03	16"	ESJ-401	GREENHECK	STORAGE ROOM	3					
L-3	540	18"x18"x4"	.06	8'-0"	ESJ-401	GREENHECK	STORAGE ROOM	4					

- 1 OR EQUAL
- 2 MOUNTING HEIGHT IS ELEVATION FROM TOP OF LOUVER TO FINISH FLOOR SLAB
- 3 INTAKE LOUVER
- 4 EXHAUST LOUVER

	ELECTRIC UNIT HEATER SCHEDULE														
NOM.		IZM	FAN MOTOR			SOU	RCE ①	LOCATION	DEMADIC						
MARK	CFM	KW	H.P.	VOLTAGE	PHASE	MODEL NUMBER	MANUFACTURER	LOCATION	REMARKS						
CH-1	240	3	.03	240	1	FFDB020	TRANE	TOILET ROOM	2						
CH-2	240	3	.03	240	1	FFDB020	TRANE	TOILET ROOM	2						
CH-3	320	6	.04	240	1	FFDB030	TRANE	STORAGE ROOM	2						

- 1 OR EQUAL
- 2 HORIZONTAL CABINET UNIT TYPE: STAMPED LOUVER, BACK INLET; STAMPED LOUVER, BOTTOM OUTLET

	DUCT CONSTRUCTION AND LEAK TEST SCHEDULE												
DUCT PRES	SSURE CLASS			DUCT	DUCT	DUCT	DUCT	REMARKS					
SUPPLY DUCT			AIR	SEAL CLASS	LEAK CLASS	TEST PRESSURE	TEST TYPE	TALITI WALL					
_	_	1/2"	_	В	24	NONE	NONE						

1) PROVIDE SHOP-FABRICATED, ZINC-COATED STEEL DUCT CONFORMING TO ASTM A653/A653M. FABRICATE CONSTRUCT, BRACE, REINFORCE, INSTALL SUPPORT, AND SEAL DUCTS AND ACCESSORIES IN ACCORDANCE WITH SMACNA.

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						EX	HAL	JST & S	UPF	PLY FA	AN SC	CHEDULE	<u>-</u>			STATION AL STA
MARK	CFM	E.S.P.	MOT	OR DATA	4	NEMA	DRIVE	CONFIGURATION	DA	MPER (BY FAN	MFGR)	SOU	RCE ①	LOCATION	REMARKS	EPAF AVAL NA\
IVIAINN	CLIVI	"W.G.	(HP)	RPM	VOLT/PH	STARTER	TYPE	CONFIGURATION	TYPE	SIZE (IN)	MAX △P ("WG)	MODEL NUMBER	MANUFACTURER	LOCATION	KEWAKKS	CODE ID. NO. 80091
EF−1	540	0.250	1/6	1750	120/1	00	DIRECT	DIRECT DRIVEN WALL PROPELLER FAN	BDD	18"x18"	.13	S1-12-426-D	GREENHECK	STORAGE ROOM	2	SCALE: NONE
F-2	225	0.125	1/15	900	120/1	00	DIDECT	CEILING CENTRIFUGAL EXHAUST FAN	BDD	8"ø	_	SP-A200	GREENHECK	TOILET ROOM	23	STA. PROJ. NO.
F-3	225	0.125	1/15	900	120/1	00	DIDECT	CEILING CENTRIFUGAL EXHAUST FAN	BDD	8"ø	_	SP-A200	GREENHECK	TOILET ROOM	23	SPEC. NO. CONSTR. CONTR. NO. N62470-03-0

- 1 OR EQUAL
- 3 WITH MODEL RDC-8, ROUND DUCT CONNECTOR.
- 2 WITH BACKDRAFT DAMPER

\cap	8"ø	ROUND DUCTWORK
		FLEXIBLE DUCT CONNECTION
	──────────────────────────────────────	BACKDRAFT DAMPER
	T	THERMOSTAT (MOUNT 5' AFF)
	M	MOTOR
	†	DOOR LOUVER
X-PLAN-CN	ABBREVI	ATIONS
3A0560PROJECTINFO,	AFF	ABOVE FINISH FLOOR
ROJEC	ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
560PI	BDD	BACKDRAFT DAMPER
	CFM	CUBIC FEET PER MINUTE
X045_CONCESSION,	СН	CABINET HEATER
ONCES	EF	EXHAUST FAN
45_C(ESP	EXTERNAL STATIC PRESSURE
	HP	HORSEPOWER
XREFS:	HZ	HERTZ
10:33, >	MFGR	MANUFACTURER
AT 10;	MAX	MAXIMUM
	PH	PHASE
12/09/03	ΔΡ	PRESSURE DROP OR DIFFERENCE
8 A	RPM	REVOLUTION PER MINUTE
	RV	RELIEF VENT
UPDATED	SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
	SP	STATIC PRESSURE
.001.DWG,	TYP	TYPICAL
⊢ ⊠ E	WG	WATER GAGE

DESIGNED & ENGINEERED BY: NAVAL FACILITIES ENGINEERING COMMAND

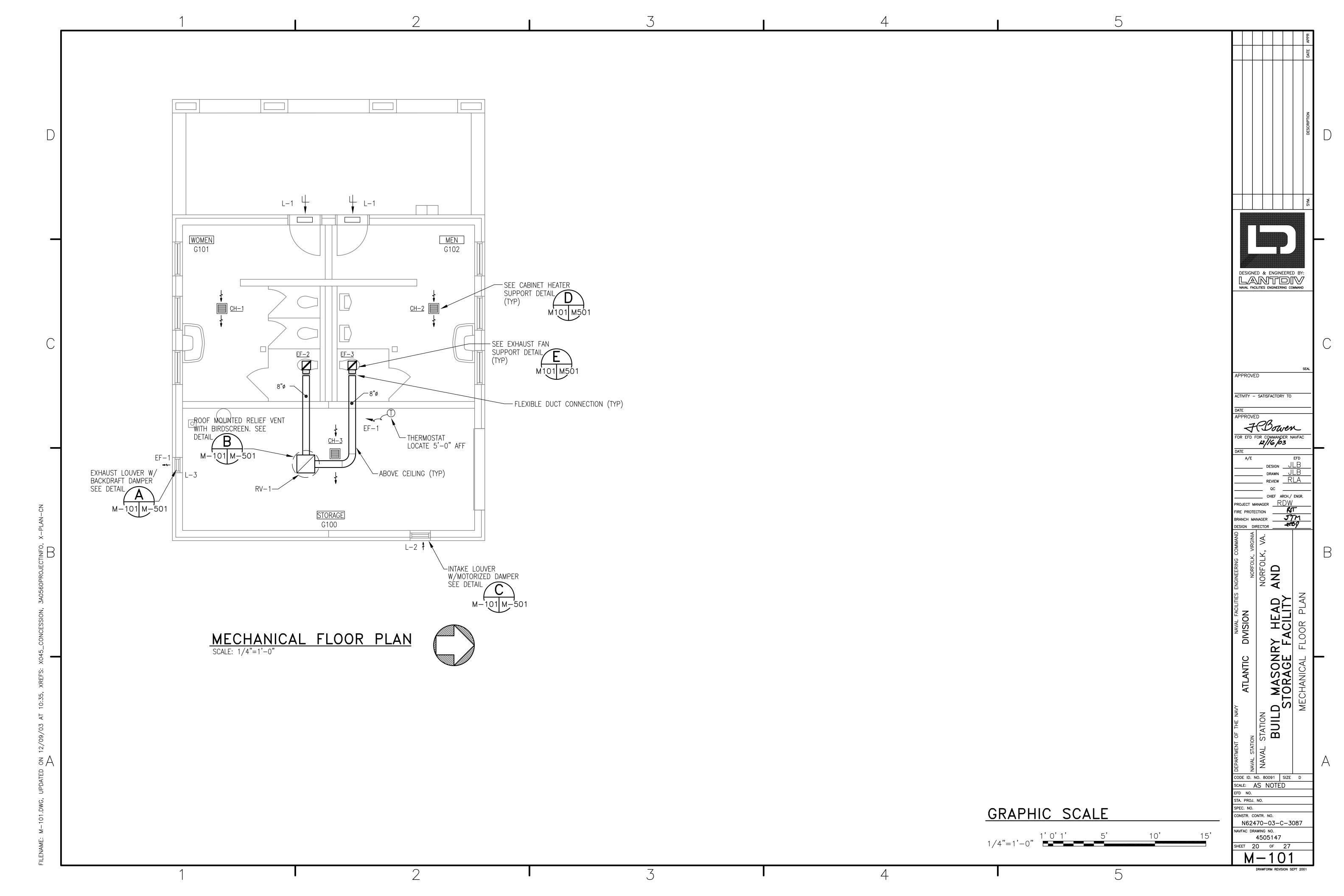
ACTIVITY - SATISFACTORY TO FCBowen FOR EFD FOR COMMANDER NAVFAC CHIEF ARCH./ ENGR. PROJECT MANAGER <u>RDW</u>

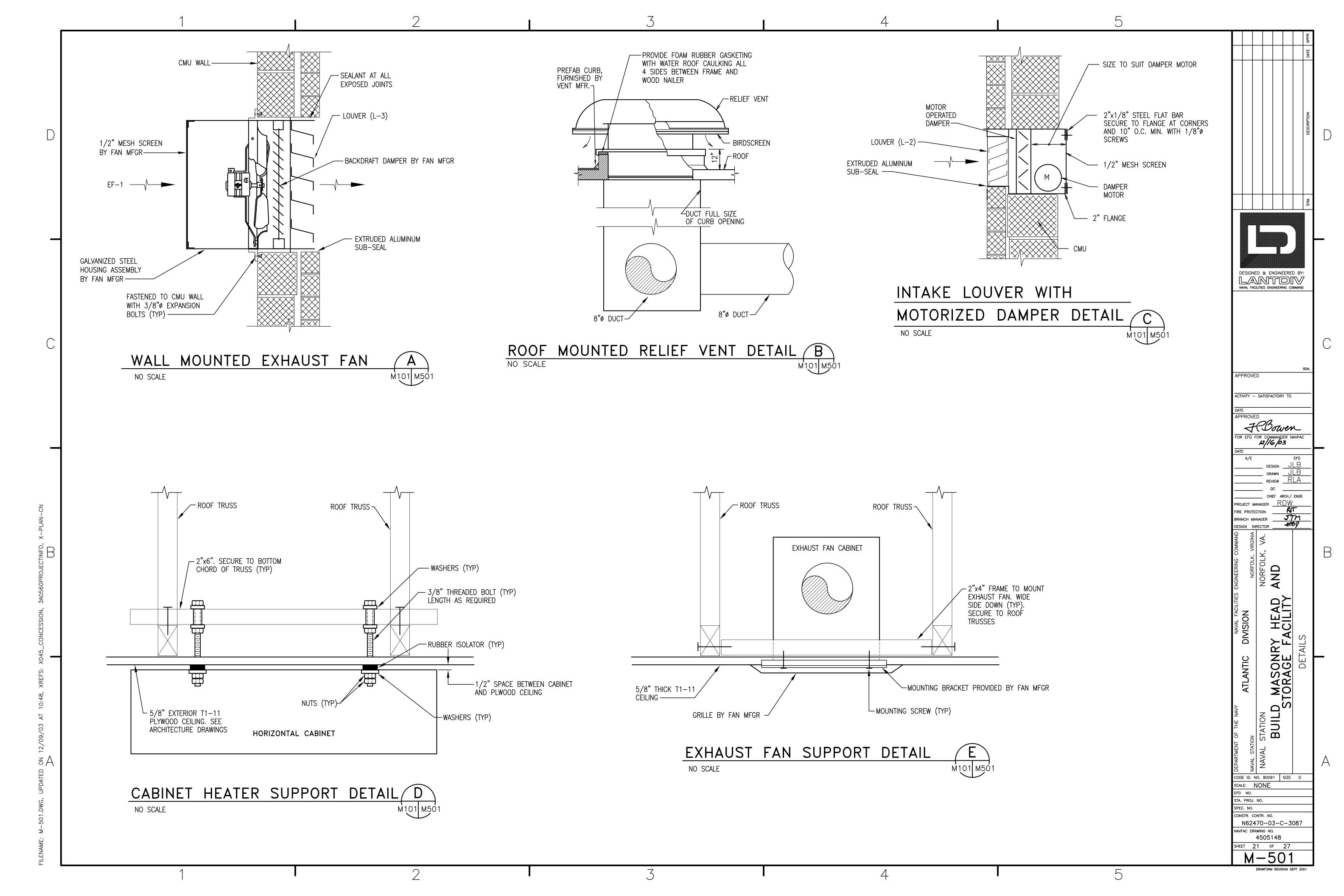
BUILD MASONRY HEAD
STORAGE FACILITY
EGEND, SCHEDULES AND GENERAL

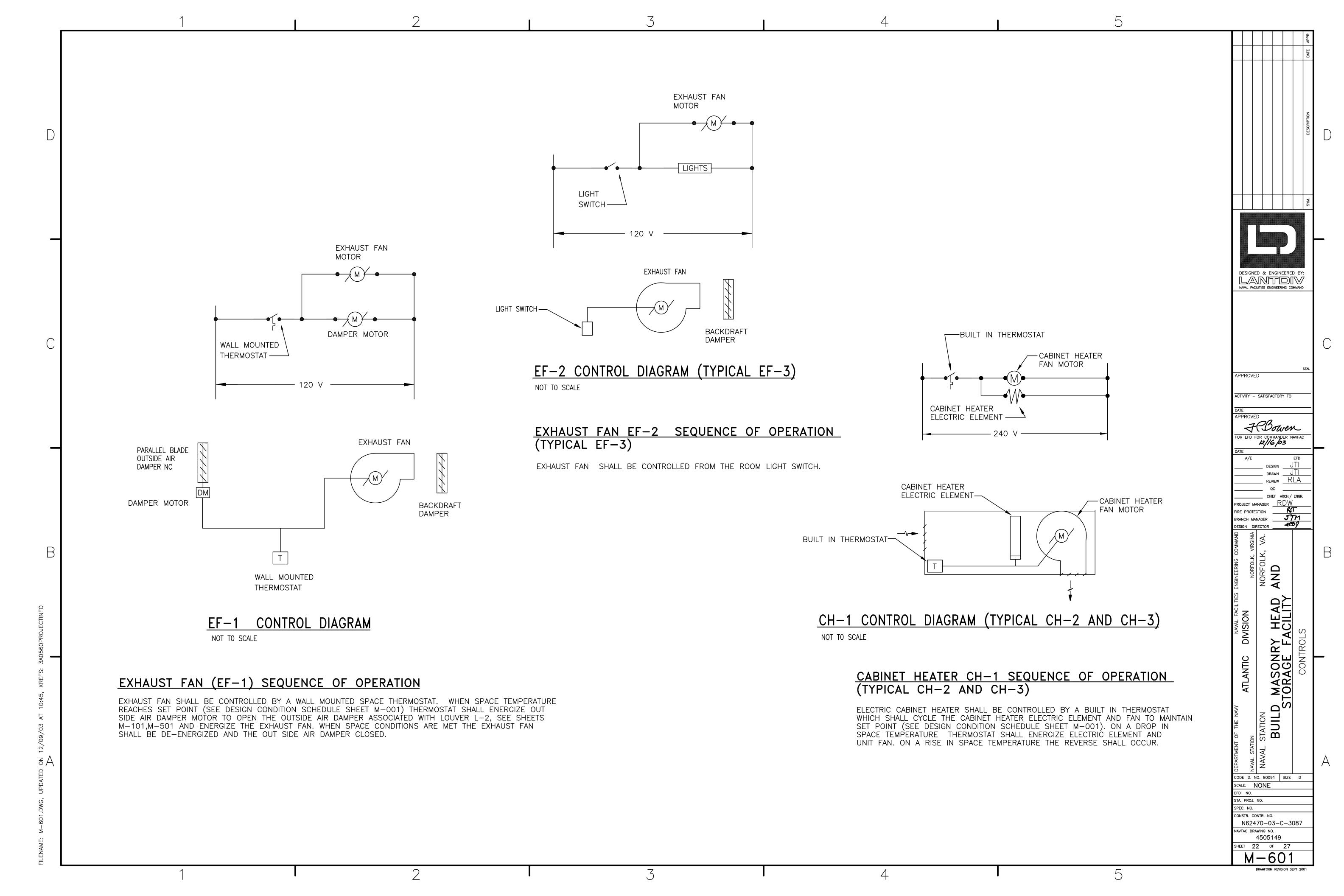
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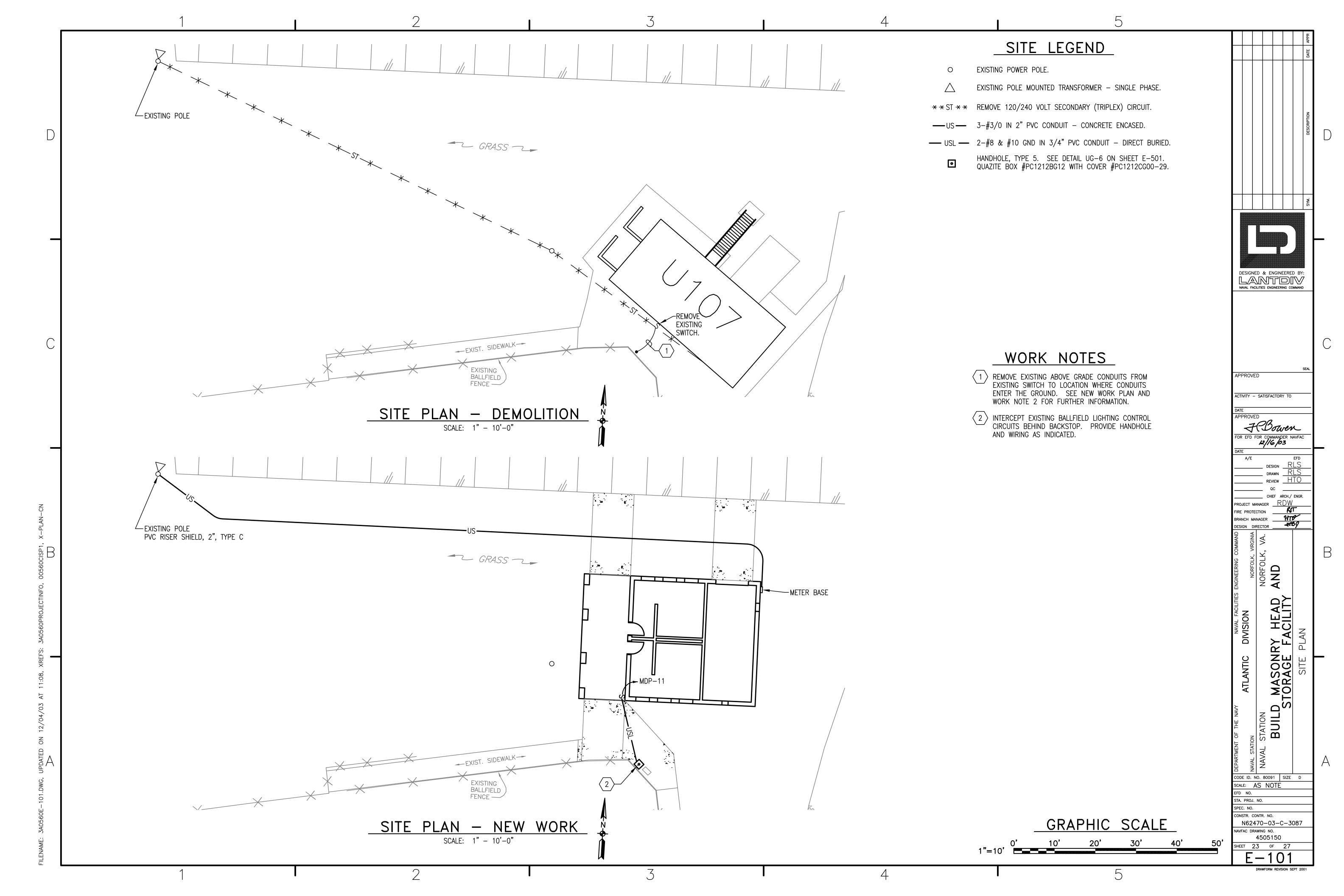
CONSTR. CONTR. NO. N62470-03-C-3087 NAVFAC DRAWING NO. 4505146 SHEET 19 OF 27

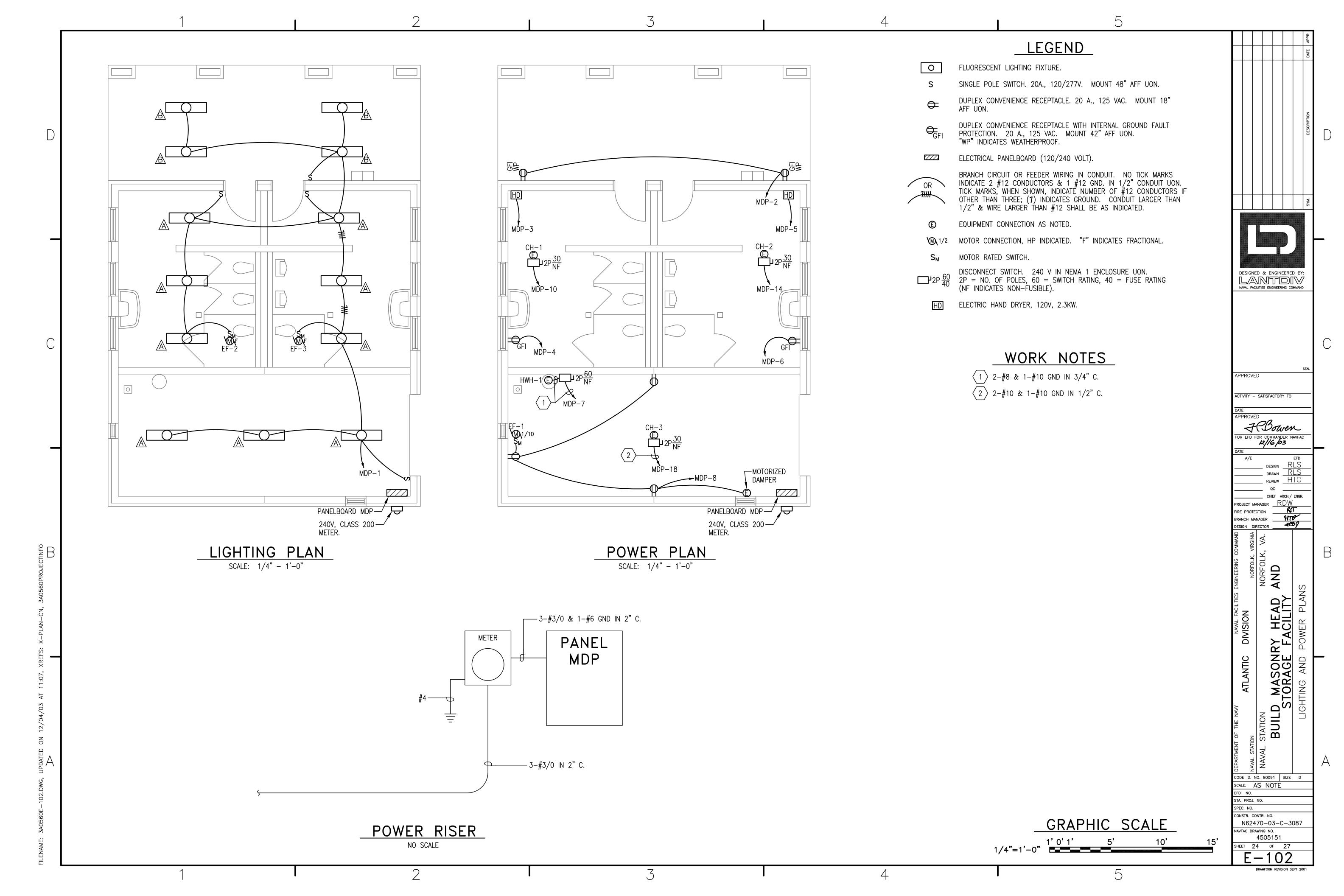
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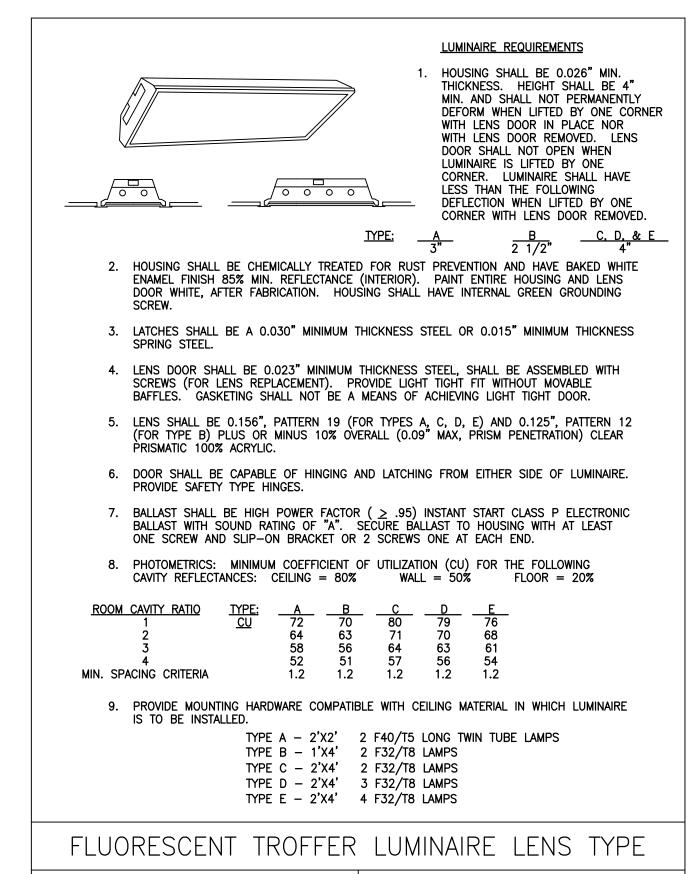




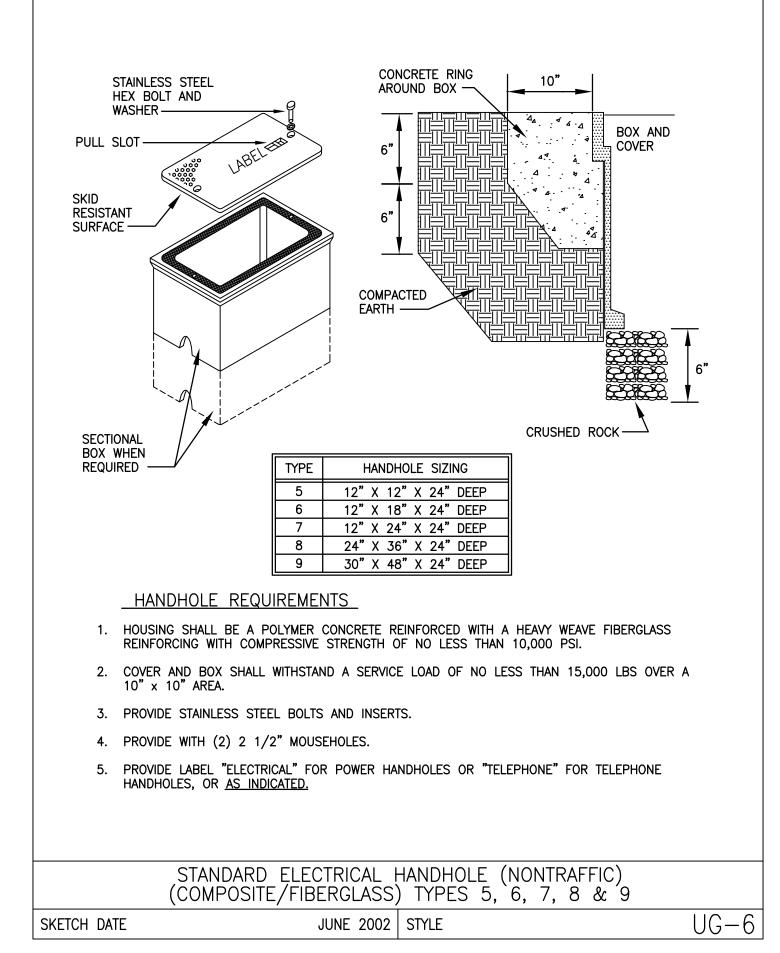


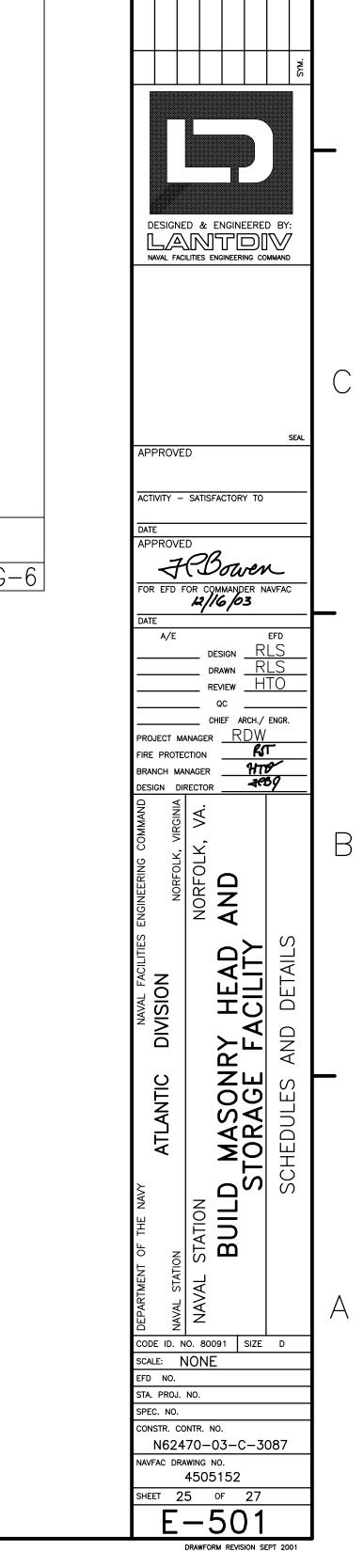


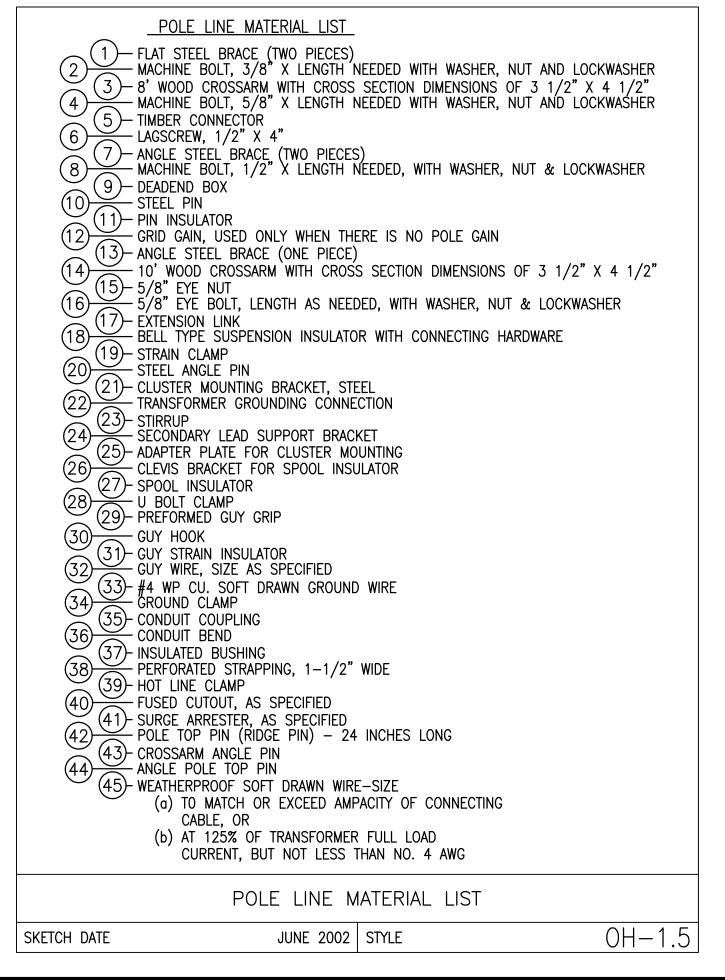
	LIGHTING FIXTURE SCHEDULE												
FIXTURE SYMBOL	NOTES												
A	NL-3, TYPE B	2-F32/T8	120V	CEILING, RECESSED	LITHONIA #SP-F-2-32-FW-A12125-120-GEB								
A	NL-3, TYPE B 2-F32/T8		120V	CEILING, RECESSED	UL DAMP LABEL, COLD TEMP. BALLAST LITHONIA #2VRT-F-2-32-VL-120-CW								

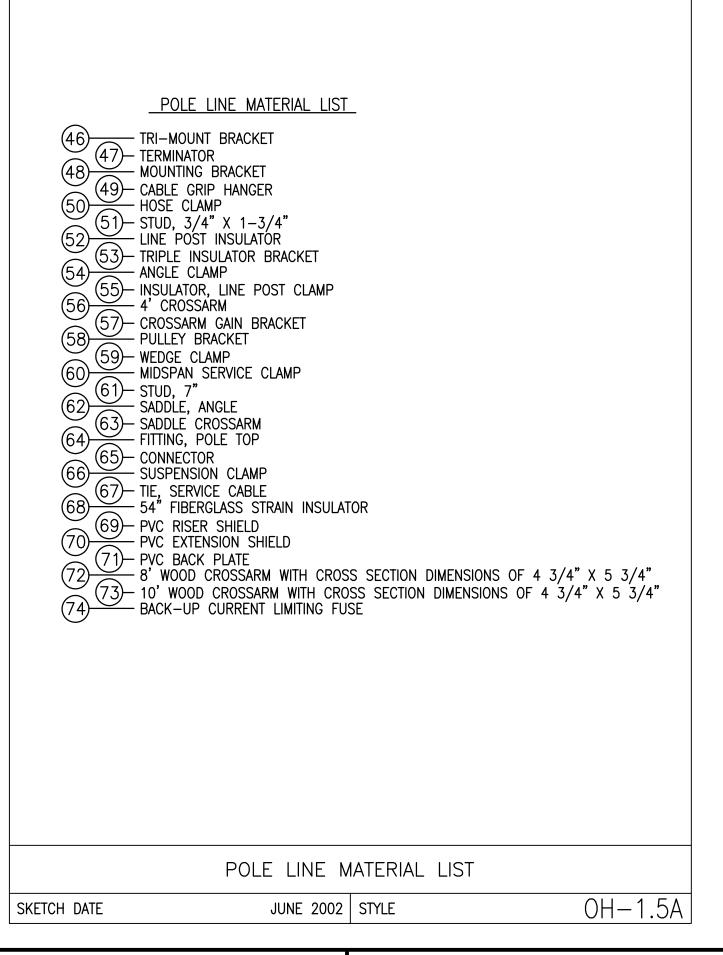


JUNE 2002 | STYLE

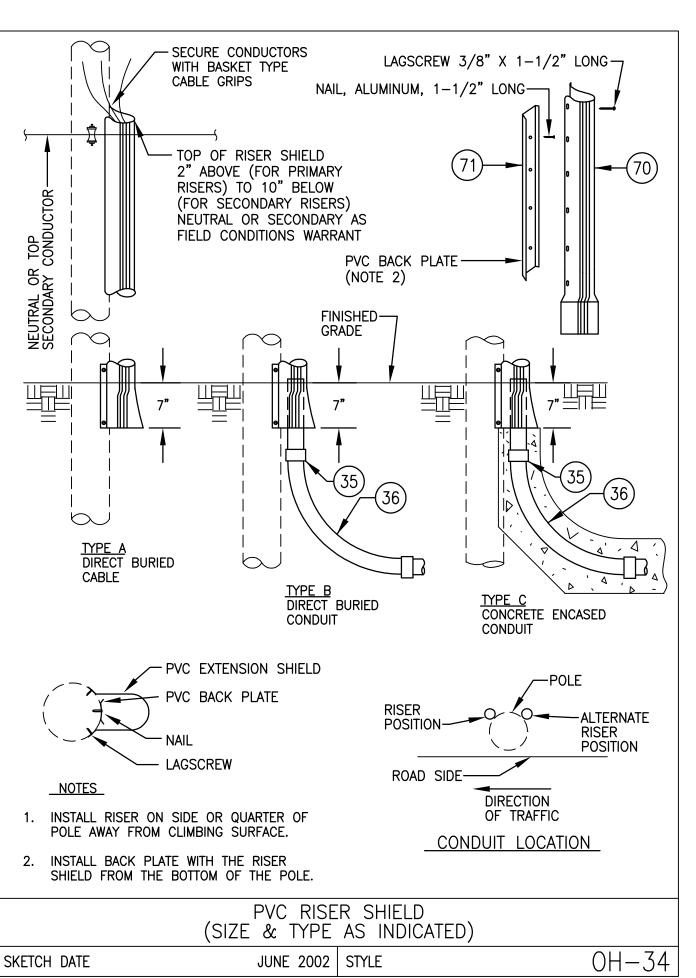








SKETCH DATE



GENERAL SPECIFICATION NOTES:

- 1 PROVIDE EQUIPMENT, MATERIALS, INSTALLATION, AND ACCORDANCE WITH THE MANDATORY AND WORKMANSHIP IN ADVISORY PROVISIONS OF NEPA 70.
- (2) PROVIDE UNDERGROUND ELECTRICAL WORK CONFORMING TO THE FOLLOWING:
 - 1.1 Submit the following for approval:

Shop Drawings

Product Data

Composite / fiberglass handholes

2.1. Plastic Conduit

NEMA TC 2 and UL 651, Type EPC-40-PVC.

2.1.1 PVC Conduit Fittings

NEMA TC 3, UL 514B, and UL 651.

2.2 Conductor Types and Color Coding

Conductors shall conform to UL 83, Type THWN. Conductors shall be color coded. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Conductor identification shall be by color—coded insulated conductors, plastic—coated self—sticking printed markers, colored nylon cable ties and plates, or heat shrink type sleeves. Conductors No. 10 AWG and smaller shall be solid copper. Conductors No. 8 AWG and larger shall be stranded copper. All conductors shall be copper. Colors for coding conductors shall be:

120/240 VOLT SYSTEM, SINGLE-PHASE

Neutral — White Phase Conductor — Black Phase Conductor — Red Grounding Conductor — Green

2.2.1 600 Volt Wire Connectors and Terminals

Shall provide a uniform compression over the entire contact surface in accordance with UL 486A. For connections above grade, connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure—type in accordance with UL 486A or UL 486C (twist—on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.2.2 600 Volt Splices

Provide splices with a compression connector on the conductor and by insulating and waterproofing using one of the following methods which are suitable for continuous submersion in water and comply with NEMA C119.1. Provide a cold—shrink rubber splice which consists of EPDM rubber tube which has been factory stretched onto a spiraled core which is removed during splice installation. The installation shall not require heat or flame, or any additional materials such as coverings or adhesive. It shall be designed for use with inline compression type connectors, for indoor, outdoor, or submerged locations.

2.3 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic and metallic core or metallic—faced, acid— and alkali—resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inches minimum width, color coded yellow with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED ELECTRIC LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.4 Grounding and Bonding Equipment

UL 467. Provide copper clad steel ground rods with diameter not less than 3/4 inch. Ground rods shall be 10 feet long.

2.5 Cast-In-Place Concrete

Shall be composed of fine aggregate, coarse aggregate, portland cement, and water so proportioned and mixed as to produce a plastic, workable mixture. Fine aggregate shall be of hard, dense, durable, clean, and uncoated sand. The coarse aggregate shall be reasonably well graded from 3/16 inch to one inch. The fine and coarse aggregates shall be free from injurious amounts of dirt, vegetable matter, soft fragments or other deleterious substances. Water shall be fresh, clean, and free from salts, alkali, organic matter, and other impurities. Concrete for encasement of underground ducts shall be 3000 psi minimum 28—day compressive strength. Concrete associated with electrical work for other than encasement of underground ducts shall be 4000 psi minimum 28—day compressive strength unless specified otherwise. Slump shall not exceed 4 inches. Retempering of concrete will not be permitted. Exposed, unformed concrete surfaces shall be given a smooth, wood float finish. Concrete shall be cured for a period of not less than 7 days, and concrete made with high early strength portland cement shall be repaired by patching honeycombed or otherwise defective areas with cement mortar as directed by the Contracting Officer. Air entrain concrete exposed to weather using an air—entraining admixture conforming to ASTM C260. Air content shall be between 4 and 6 percent.

2.6 Composite / Fiberglass Handholes and Covers

Provide handholes and covers as indicated. Handholes and covers shall be of polymer concrete, reinforced with heavy weave fiberglass.

3.1 Cast-In-Place Concrete

Cast-in-place concrete work shall conform to the requirements of ACI 318M/318RM.

3.2 Underground Conduit

The type of conduit shall be EPC-40-PVC.

3.3 Conduit Installation

The top of the conduit shall be not less than 24 inches below grade, and shall have a minimum slope of 3 inches in each 100 feet away from buildings and toward handholes and other necessary drainage points. Run conduit in straight lines except where a change of direction is necessary. Terminate conduits in end—bells where they enter underground structures.

3.3.1 Encasement Under Roads and Structures

Under roads and paved areas, install conduits in concrete encasement of rectangular cross—section providing a minimum of 3 inches concrete cover around ducts. The concrete encasement shall extend at least 5 feet beyond the edges of paved areas and roads. Before pouring concrete, anchor conduit to prevent the conduit from floating during concrete pouring. Anchoring shall be done by driving reinforcing rods adjacent to conduit and attaching the rod to the conduit.

3.3.2 Installation of Warning and Identification Tape

Provide warning tape for underground conduit. Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

3.4 Composite / Fiberglass Handhole Installation

Install as indicated and in accordance with the manufacturer's instructions.

3.5 600 Volt Cable Splicing and Terminating

Provide splices and terminations to protect 600 volt insulated power and lighting cables from accidental contact, deterioration of coverings and moisture. Make terminations and splices with materials and methods as indicated or specified herein and as designated by the written instructions of the manufacturer. Make splices in underground distribution systems only in accessible locations such as handholes.

3.6 Cable End Caps

Cable ends shall be sealed at all times with coated heat shrinkable or cold—shrink end caps.

3.7 Grounding Systems

Noncurrent—carrying metallic parts associated with electrical equipment shall have a maximum resistance to solid earth ground not exceeding 5 ohms.

3.7.1 Grounding Electrodes

Provide cone pointed ground rods driven full depth plus 6 inches.

3.7.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

3.7.3 Grounding Conductors

Unless otherwise indicated, grounding conductors shall be stranded—bare copper conforming to ASTM B8, Class B, for sizes No. 6 AWG and larger, and shall be solid—bare copper conforming to ASTM B1 for sizes No. 8 and smaller.

- 3.8 Performance of Field Acceptance Checks and Tests
- 3.8.1 600 Volt Cable Tests

Perform tests after wiring is completed, connected, and ready for operation, but prior to placing systems in service and before any branch circuit breakers are closed.

- a. Inspect cables for physical damage and proper connection in accordance with contract plans and specifications.
- b. Check cable color coding for compliance with contract specifications.
- c. Perform continuity test to insure proper cable connection.
- (3) PROVIDE INTERIOR DISTRIBUTION SYSTEM CONFORMING TO THE FOLLOWING:
 - 1.3 Submit the following for approval:

Shop Drawings

Panelboards

Product Data

Receptacles Circuit Breakers Switches Manual Motor Starters Metering 2.1 Materials and Equipment

Materials, equipment, and devices shall, as a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70.

2.2 CONDUIT AND FITTINGS

Shall conform to the following:

2.2.1 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797, NEMA C80.3.

2.2.2 Flexible Metal Conduit

UL 1.

2.2.2.1 Liquid—Tight Flexible Metal Conduit, Steel

UL 360.

2.2.3 Fittings for EMT, and Flexible Metal Conduit

UL 514B. Ferrous fittings shall be cadmium— or zinc—coated in accordance with UL 514B.

2.2.3.1 Fittings for EMT

Steel compression type.

2.3 OUTLET BOXES AND COVERS

UL 514A, cadmium— or zinc—coated.

2.4 WIRES AND CABLES

Wires and cables shall meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated.

2.4.1 Conductors

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid. All conductors shall be copper.

2.4.1.1 Minimum Conductor Sizes

Minimum size for branch circuits shall be No. 12 AWG.

2.4.2 Color Coding

Provide for service, feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors and white for neutrals. Color of ungrounded conductors shall be as follows:

120/240 volt, single phase: Black and red

2.4.3 Insulation

Unless specified or indicated otherwise or required by NFPA 70, power and lighting wires shall be 600-volt, Type THWN/THHN conforming to UL 83, except that grounding wire may be type TW conforming to UL 83. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.4.4 Bonding Conductors

ASTM B 1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B 8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.4.5 Service Entrance Cables

Underground Service Entrance (USE) Cables, UL 854.

2.5 SPLICES AND TERMINATION COMPONENTS

UL 486A for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure—type in accordance with UL 486A or UL 486C (twist—on splicing connector). Provide solderless terminal lugs on stranded conductors.

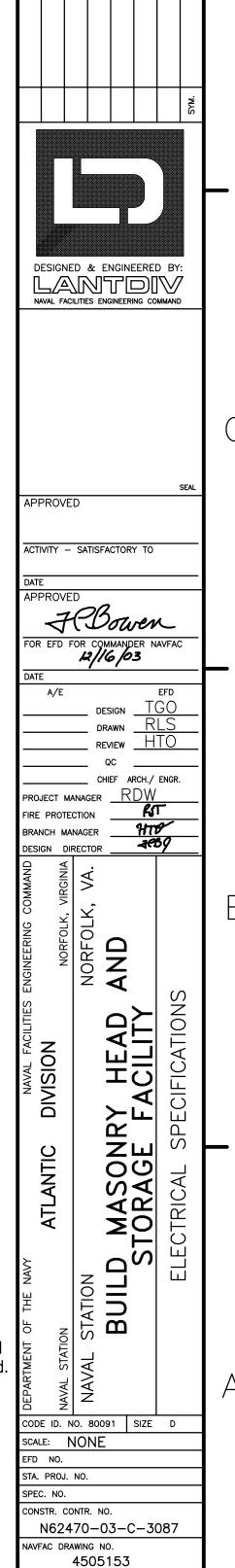
2.6 DEVICE PLATES

Provide UL listed, one—piece device plates for outlets to suit the devices installed. For metal outlet boxes, plates on unfinished walls shall be of zinc—coated sheet steel or cast metal having round or beveled edges. Plates on finished walls shall be nylon or lexan, minimum 0.03 inch wall thickness. Plates shall be same color as receptacle or toggle switch with which they are mounted. Screws shall be machine—type with countersunk heads in color to match finish of plate. Plates installed in wet locations shall be gasketed and UL listed for "wet locations."

2.7 SWITCHES

2.7.1 Toggle Switches

NEMA WD 1, UL 20, single pole, totally enclosed with bodies of thermoplastic and/or thermoset plastic and mounting strap with grounding screw. Handles shall be ivory thermoplastic. Wiring terminals shall be screw—type, side—wired. Contacts shall be silver—cadmium and contact arm shall be one—piece copper alloy. Switches shall be rated quiet—type ac only, 120/277 volts, with current rating and number of poles indicated.



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2.7.2 Disconnect Switches

NEMA KS 1. Switches serving as motor—disconnect means shall be horsepower rated. Provide switches in NEMA 1, enclosure per NEMA ICS 6.

2.8 RECEPTACLES

UL 498, hard use, heavy—duty, grounding—type. Ratings and configurations shall be as indicated. Bodies shall be of ivory as per NEMA WD 1. Face and body shall be thermoplastic supported on a metal mounting strap. Dimensional requirements shall be per NEMA WD 6. Provide screw—type, side—wired wiring terminals. Connect grounding pole to mounting strap. The receptacle shall contain triple—wipe power contacts and double or triple—wipe ground contacts.

2.8.1 Weatherproof Receptacles

Provide in cast metal box with gasketed, weatherproof, cast—metal cover plate and gasketed cap over each receptacle opening. Provide caps with a spring—hinged flap. Receptacle shall be UL listed for use in "wet locations with plug in use."

2.8.2 Ground-Fault Circuit Interrupter Receptacles

UL 943, duplex type for mounting in standard outlet box. Device shall be capable of detecting current leak of 6 milliamperes or greater and tripping per requirements of UL 943 for Class A GFI devices. Provide screw—type, side—wired wiring terminals or pre—wired (pigtail) leads.

2.9 PANELBOARDS

UL 67 and UL 50 having a short—circuit current rating as indicated. Panelboards for use as service disconnecting means shall additionally conform to UL 869A. Panelboards shall be circuit breaker—equipped. Main breaker shall be "separately" mounted "above" or "below" branch breakers. Where "space only" is indicated, make provisions for future installation of breakers. Directories shall indicate load served by each circuit in panelboard. Type directories and mount in holder behind transparent protective covering. Panelboards shall be listed and labeled for their intended use.

2.9.1 Panelboard Buses

Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet.

2.9.2 Circuit Breakers

UL 489, thermal magnetic—type having a minimum short—circuit current rating equal to the short—circuit current rating of the panelboard in which the circuit breaker shall be mounted. Plug—in circuit breakers are unacceptable.

2.9.2.1 Multipole Breakers

Provide common trip-type with single operating handle.

2.10 MOTORS

NEMA MG 1

2.10.1 Motor Sizes

Provide size for duty to be performed.

2.11 MANUAL MOTOR STARTERS (MOTOR RATED SWITCHES)

Single pole designed for surface mounting with overload protection.

2.12 GROUNDING AND BONDING EQUIPMENT

UL 467. Ground rods shall be copper—clad steel, with minimum diameter of 3/4 inch and minimum length of 10 feet.

2.13 METERING

NEMA C12.1. Provide a self—contained, socket—mounted, electronic programmable outdoor watthour meter. Meter shall either be programmed at the factory or shall be programmed in the field. Turn field programming device over to the Contracting Officer at completion of project. Meter shall be coordinated to system requirements.

- a. Design: Provide watthour meter designed for use on a single—phase, three—wire, 240/120 volt system. Include necessary KYZ pulse initiation hardware for Energy Monitoring and Control System (EMCS).
- b. Class: 200; Form: 2S , accuracy: +/- 1.0 percent; Finish: Class II
- c. Cover: Polycarbonate and lockable to prevent tampering and unauthorized removal.
- d. Kilowatt—hour Register: five digit electronic programmable type
- e. Demand Register:
- Provide solid state.
- (2) Meter reading multiplier: Indicate multiplier on the meter face.
- (3) Demand interval length: Shall be programmed for 15 minutes with rolling demand up to six subintervals per interval.

f. Socket: IEEE C12.7. Provide NEMA Type 3R, box—mounted socket, ringless, having jaws compatible with requirements of the meter. Provide manufacturers standard enclosure color unless otherwise indicated.

3.1 INSTALLATION

Electrical installations shall conform to requirements of NFPA 70 and to requirements specified herein.

3.1.1 Wiring Methods

Provide insulated conductors installed in EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit. Minimum conduit size shall be 1/2 inch in diameter for low voltage lighting and power circuits.

- 3.1.1.1 Restrictions Applicable to EMT
- a. Do not install underground.
- b. Do not encase in concrete, mortar, grout, or other cementitious materials.
- c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.
- d. Do not use outdoors.
- 3.1.5.3 Restrictions Applicable to PVC Schedule 40 Nonmetallic Conduit
- Do not use above grade, except for rising through floor slab.
- 3.1.1.3 Service Entrance Conduit, Underground

PVC, Type—EPC 40. Underground portion shall be encased in minimum of 3 inches of concrete and shall be installed minimum 18 inches below slab or grade.

3.1.1.4 Underground Conduit Other Than Service Entrance

PVC, Type EPC-40.

3.1.2 Conduit Installation

Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

3.1.2.1 Flexible Connections

Provide flexible steel conduit between 3 and 6 feet in length for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Provide separate ground conductor across flexible connections.

3.1.3 Mounting Heights

Mount panelboards, circuit breakers, and disconnecting switches so height of operating handle at its highest position is maximum 78 inches above floor. Mount lighting switches 48 inches above finished floor, receptacles 18 inches above finished floor unless otherwise indicated, and other devices as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet.

3.1.4 Grounding and Bonding

In accordance with NFPA 70.

3.1.5 Watthour Meters

NEMA C12.1.

- 3.2 FIELD QUALITY CONTROL
- 3.2.1 600-Volt Wiring Test

Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist.

3.2.2 Ground-Fault Receptacle Test

Test ground—fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed.

3.2.3 Grounding System Test

Test grounding system to ensure continuity, and that resistance to ground is not excessive.

- 3.2.4 Watthour Meter
- a. Visual and mechanical inspection
- (1) Examine for broken parts, shipping damage, and tightness of connections.
- (2) Verify that meter type, scales, and connections are in accordance with approved shop drawings.
- b. Electrical tests
- (1) Determine accuracy of meter.

- (2) Calibrate watthour meters to one—half percent.
- (3) Verify that correct multiplier has been placed on face of meter, where applicable.
- (4) PROVIDE INTERIOR LIGHTING CONFORMING TO THE FOLLOWING:
 - 1.1 Submit the following for approval:

Product Data

Fluorescent lighting fixtures
Fluorescent electronic ballasts
Fluorescent lamps

2.1 FLUORESCENT LIGHTING FIXTURES

UL 1598. Fluorescent fixtures shall have electronic ballasts. Provide fixtures that can be relamped from the bottom. Access to ballast shall be from the bottom. Trim for the exposed surface of flush—mounted fixtures shall be as indicated.

2.1.1 Fluorescent Lamp Electronic Ballasts

The electronic ballast shall as a minimum meet the following characteristics:

- a. Ballast shall comply with UL 935, NEMA C82.11, and NFPA 70. Ballast shall provide transient immunity as recommended by IEEE C62.41. Ballast shall be designed for the wattage of the lamps used in the indicated application. Ballasts shall be designed to operate on the voltage system to which they are connected.
- b. Power factor shall be 0.95 (minimum)
- c. Ballast shall operate at a frequency of 20,000 Hertz (minimum).
- d. Ballast shall have light regulation of plus or minus 10 percent lumen output with a plus or minus 10 percent input voltage regulation. Ballast shall have 10 percent flicker (maximum) using any compatible lamp.
- e. Ballast shall be UL listed Class P with a sound rating of "A."
- f. Ballast shall have circuit diagrams and lamp connections displayed on the ballast.
- g. Ballasts shall be instant start. Instant start ballasts shall operate lamps in a parallel circuit configuration that permits the operation of remaining lamps if one or more lamps fail or are removed.
- h. Ballast shall be capable of starting and maintaining operation at a minimum of 0 degrees F unless otherwise indicated.
- i. Electronic ballast shall have a full replacement warranty of 5 years from date of manufacture.
- 2.1.1.1 T-8 Lamp Ballast

Total harmonic distortion (THD) shall be 20 percent (maximum). Input wattage shall be 62 watts (maximum) when operating two F32T8 lamps

2.1.2 Fluorescent Lamps

T-8 rapid start low mercury lamps shall be rated 32 watts (maximum), 2800 initial lumens (minimum), CRI of 75 (minimum), color temperature of 3500 K, and an average rated life of 20,000 hours. Low mercury lamps shall have passed the EPA Toxicity Characteristic Leachate Procedure (TCLP) for mercury by using the lamp sample preparation procedure described in NEMA LL 1. Average rated life is based on 3 hours operating per start.

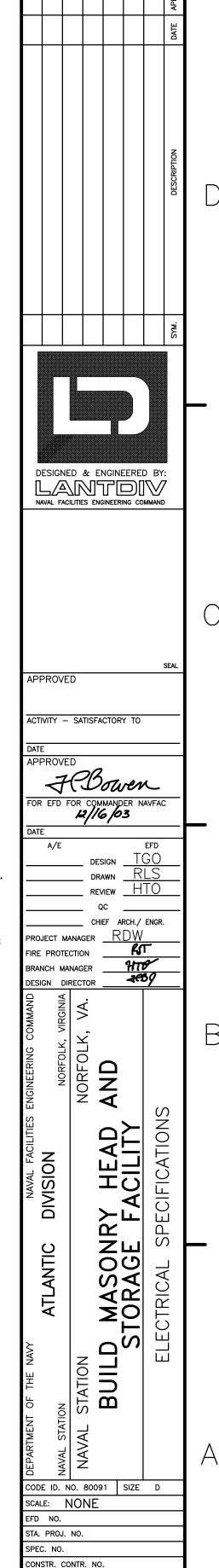
2.2 SUPPORT HANGERS FOR LIGHTING FIXTURES IN SUSPENDED CEILINGS

Provide wires conforming to ASTM A 641/A 641M, galvanized regular coating, soft temper, 0.1055 inch in diameter (12 gage).

3.1 Lighting Fixture Installation

Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Installation shall meet requirements of NFPA 70. Obtain approval of the exact mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Recessed and semi—recessed fixtures shall be independently supported from the building structure by a minimum of four wires per fixture and located near each corner of each fixture. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures. Do not support fixtures by ceiling acoustical panels.

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